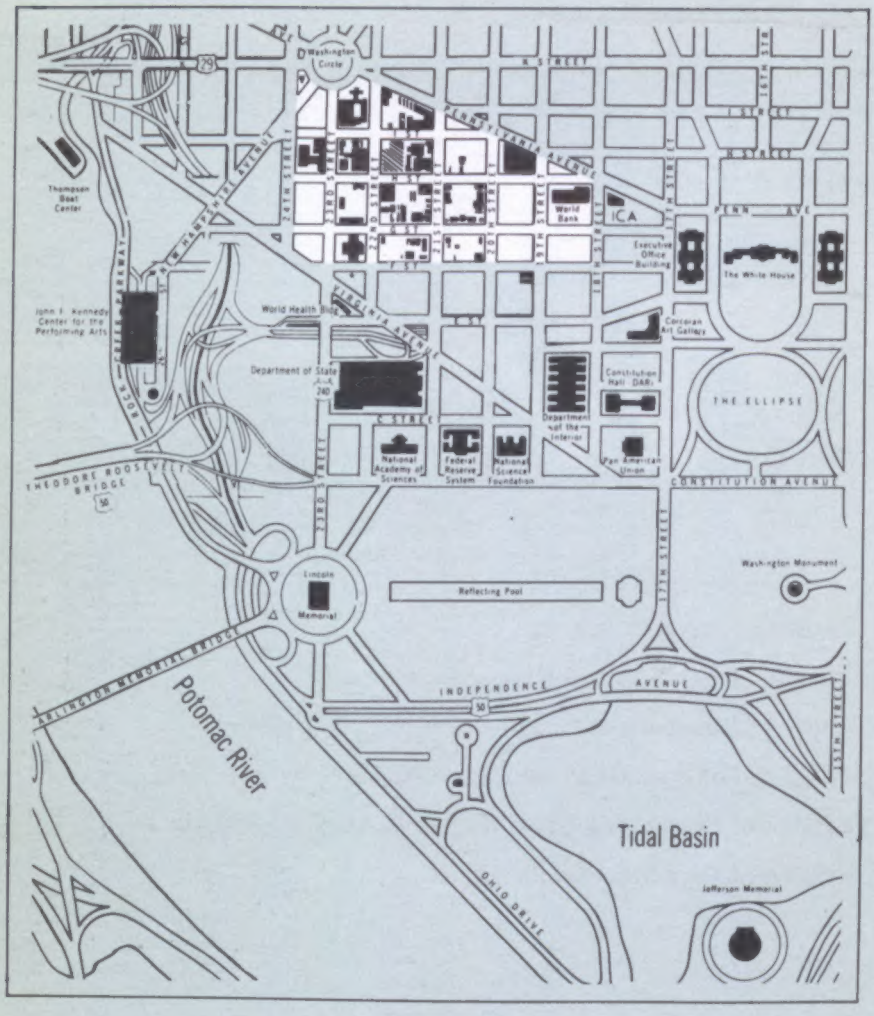


THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D.C.

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THE GEORGE WASHINGTON UNIVERSITY BULLETIN

UNDERGRADUATE AND GRADUATE PROGRAMS
1983-1984

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

School of Public and International Affairs

Division of Continuing Education and Summer Sessions

Division of Experimental Programs

For information concerning the School of Engineering and Applied Science, the National Law Center, or the School of Medicine and Health Sciences, please request the appropriate bulletin.

UNIVERSITIES are undergoing change, either drastically or slowly, as they have been for centuries. Whatever the changes, the one premise on which universities are based remains constant: universities are for learning—for acquiring learning, for transmitting learning, and for the exploration that yields new learning. Any other objective is unworthy of a university, and any other purpose is incompatible with the best interests of students and their relationship to the institution.

The faculty, through scholarship and research, extends learning, and it transmits learning by teaching. Students learn from the faculty, the library, and the laboratory—if they accept, as they must, learning as their objective. This learning does not take place in a vacuum; in addition to the particular content of learning, students will develop certain habits of mind—analytical thinking, powers of insight, self-examination, and the use of rational discourse—that will serve them throughout their personal and professional lives.

Within this basic context, George Washington University invites students to take up their residence in order that their energies, interests, and talents may be directed to learning.

Exceptional opportunities for learning are made possible because of the University's location in the heart of the nation's capital. For example, cooperative programs are conducted in various fields of study with members of Congress, the Smithsonian Institution, the Library of Congress, the National Gallery of Art, and other federal and private organizations. In addition to these programs, Washington presents opportunities for observation, study, service, and recreation limited only by students' time, energy, and imagination.

In this atmosphere, George Washington University seeks to provide a matrix for learning not available in the standard university education, so that graduates can never forget that as students they were at the center of government and that they must forever carry additional responsibility in and for society, because of the opportunity that was theirs.

The George Washington University
LLOYD H. ELLIOTT
President

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1983

AUGUST

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1983 FALL SEMESTER

August 29 — Orientation begins for students from foreign countries and for freshmen who did not attend Summer Advance Registration Program

August 30 — Placement tests and advising for entering freshmen who did not attend Summer Advance Registration Program

Orientation begins for transfer students

August 31 — Placement tests and advising for transfer students

Advising for sophomores, juniors, and seniors in the School of Government and Business Administration

†*August 31-September 2* — Registration; application for February graduation due as part of registration

September 5 — Labor Day (holiday)

September 6 — On-campus classes begin

September 7 — Off-campus classes begin

University Faculty Assembly meeting

* The Academic Calendar is subject to change.

† The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

September 16	Faculty Senate meeting
October 12	Applications due for November Master's Comprehensive Examinations in the School of Public and International Affairs and in the School of Government and Business Administration
October 14	Faculty Senate meeting
October 20	Board of Trustees meeting
November 1	Applications due for spring semester financial aid
November 11	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations Faculty Senate meeting
November 11-12	School of Public and International Affairs and School of Government and Business Administration Master's Comprehensive Examinations
November 21	D.B.A., D.P.A., Ed.D., and Ph.D. dissertations due from February candidates
November 23	Thanksgiving holiday begins after last class
November 28	Classes resume
December 6	Last day of fall semester on-campus classes
December 9	Faculty Senate meeting
December 10	Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
December 12-21	Examination period
December 19	Last day of fall semester off-campus classes

1984 SPRING SEMESTER

January 6	Master's theses due from February candidates
January 9	Orientation for students from foreign countries
January 10-11	Orientation for new students; advising for all students
January 11	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for February graduation
**January 11-13*	Registration; application for May graduation due as part of registration
January 16	Spring semester on-campus and off-campus classes begin
January 19	Board of Trustees meeting
January 20	Faculty Senate meeting
January 24	University Faculty Assembly meeting
February 1	Deadline for submission of 1984-85 freshman student financial aid applications
February 10	Faculty Senate meeting
February 20	Winter Convocation (holiday)
March 1	Deadline for submission of 1984-85 undergraduate continuing and transfer student financial aid applications Ph.D. and Ed.D. dissertations due from May candidates

* The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

March 7	Applications due for April Master's Comprehensive Examinations in the School of Public and International Affairs and the School of Government and Business Administration
March 9	Faculty Senate meeting
March 10	Spring recess begins after last class
March 15	Board of Trustees meeting
March 16	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
March 19	Classes resume
March 26	D.B.A. and D.P.A. dissertations due from May candidates
April 1	Deadline for submission of Summer Sessions and 1984-85 graduate financial aid applications
April 13	Faculty Senate meeting
April 13-14	School of Government and Business Administration and School of Public and International Affairs Master's Comprehensive Examinations
April 14	Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
April 16	Master's theses due from all May candidates except those in the School of Public and International Affairs
April 19	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation
April 20	Last day of spring semester on-campus classes Master's theses due from May candidates in the School of Public and International Affairs
April 23	Last day of spring semester off-campus classes
April 26-May 5	Examination period
May 1	Last day for current master's degree candidates in the Graduate School of Arts and Sciences to apply for Ph.D. programs
May 4	Faculty Senate meeting
May 6	Commencement
May 17	Board of Trustees meeting

FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

General Information	Private, nonsectarian, coeducational, founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-campus Students	8,926 full-time; 9,847 part-time
Geographical Origin of Students	50 states, District of Columbia, 120 countries
1983-84 Tuition	$228 per semester hour, not to exceed $6,100 (see pages 28-33)
Number of Full-time Faculty	1,095 (89% with doctoral degrees)
Number of Part-time Faculty	570 (includes some of the most distinguished men and women in Washington)
Room and Board	Cost varies from approximately $3,500 to $4,080 for the academic year (see pages 60-61)

Undergraduate majors: Accounting, American Civilization, American Literature, Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classical Humanities, Computer Science, Criminal Justice, Dramatic Art, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, English Literature, Environmental Studies, Fine Arts, French Language and Literature, Geodesy, Geography, Geology, Germanic Languages and Literatures, History, Human Kinetics and Leisure Studies, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Mathematics, Mechanical Engineering, Medical Technology, Middle Eastern Studies, Music, Nurse Practitioner, Nursing Anesthesia, Operations Research and Computational Science, Philosophy, Physician Assistant, Physics, Political Communications, Political Science, Psychology, Public Affairs, Radio-Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Secondary Education, Sociology, Spanish-American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech-Language Pathology and Audiology, Statistics, Urban Affairs, Zoology

Study leading to graduate or professional degrees is offered in the Graduate School of Arts and Sciences, the National Law Center, the School of Medicine and Health Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

THE UNIVERSITY

HISTORY

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company, "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended a "fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he hoped to see established.

PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "the aspirations of Washington, Jefferson and Madison, for the erection of a university at the seat of the Federal Government." Over the years it has been the aim to develop the University ideal in the nation's capital with a view toward meeting the changing needs of society while continuing to pursue the traditional principles of learning and research.

The George Washington University now rededicates itself and all the resources at its command to the pursuit of knowledge and its dissemination.

To this end:

The University recognizes its special opportunities in and obligations to one of the principal capitals of the world. It is a primary objective of the University to utilize its historical, geographical, and functional relationship to the nation's capital and the Washington community in continuing the development of a great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge to develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian and coeducational.

Admission to the University is determined only in terms of the personal character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of the University.

Expansion of graduate and professional studies and research and the utilization for this purpose of the excellent research facilities and materials available in the nation's capital are basic to the continuous development of the University's educational program.

The provision of superior instruction and facilities and the application of high standards of entrance qualifications and academic achievement to all students whether full-time or part-time, on-campus or off-campus, are major missions of the University.

A balanced program of student extracurricular activities is an integral part of the University program.

The University will continue to strive to meet the evident needs of an enlarged student body while governing the size of enrollment by its capacity to supply adequate staff and facilities for the excellent teaching and research which it espouses.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 10 colleges, schools, and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Music. The College also provides prelegal and premedical programs, and the preprofessional work required for admission

* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Bachelor of General Studies, Bachelor of Science in Geodesy, and Bachelor of Science in Cartographic Science. These off-campus programs are administered by the Division of Continuing Education and Summer Sessions.

*The Graduate School of Arts and Sciences**† offers advanced study and research leading to the degrees of Master of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts and Master of Science are also available through off-campus programs administered by the Division of Continuing Education and Summer Sessions.

*The School of Medicine and Health Sciences**‡ offers work leading to the degrees of Associate in Science, Bachelor of Science, Bachelor of Science in Health Science, and Doctor of Medicine.

The National Law Center† offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, mechanical engineering, and operations research and computational science. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the Division of Continuing Education and Summer Sessions.

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education and Human Development, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education and Human Development is also available through off-campus programs administered by the Division of Continuing Education and Summer Sessions.

The School of Government and Business Administration† offers undergraduate programs leading to the degrees of Bachelor of Accountancy and Bachelor of Business Administration and graduate programs leading to the

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* The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

† The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering programs leading to combined Juris Doctor and Master's degrees.

‡ Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

degrees of Master of Accountancy, Master of Business Administration, Master of Health Services Administration, Master of Public Administration, Master of Science in Information Systems Technology, Master of Urban and Regional Planning, Post-Master's Graduate Certificate in Health Services Administration, Doctor of Business Administration, and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts.

The Division of Continuing Education and Summer Sessions assists in providing continuing education programs for adult students by administering or coordinating the off-campus credit offerings of the colleges and schools of the University, at both the undergraduate and graduate levels. Noncredit courses are also offered through the Division.

The Division of Experimental Programs supports University-wide curricular experimentation and development, especially the development of new courses and new programs that entail interdisciplinary or interschool cooperation or that utilize educational resources in the Washington community.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association. The School of Medicine and Health Sciences is a member of the Association of American Medical Colleges and is one of the medical colleges which have been continuously approved by the American Medical Association. Undergraduate curricula of the School of Engineering and Applied Science in civil, electrical, and mechanical engineering are accredited by the Accreditation Board for Engineering and Technology. The School of Education and Human Development is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business and, in 1977, its undergraduate program was accredited by the Assembly. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and

* The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering programs leading to combined Juris Doctor and Master's degrees.

the Certified Management Accountant professional examinations. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Public Administration program is on the approved list of the National Association of Schools of Public Affairs and Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planners Association. The Department of Chemistry is on the approved list of the American Chemical Society. The Department of Music is an accredited member of the National Association of Schools of Music. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech-language pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain approximately 1,270,000 volumes, to which are added some 50,000 volumes a year. Endowments supplementing the University appropriation provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences; and gifts from many sources have enriched the collections. The libraries currently receive about 14,000 serials.

Information concerning the use of the libraries may be obtained at the library service desks.

The library is administered for the curricular, research, and recreational needs and interests of the students. Instruction in the use of the library is given by the reference librarians. The library endeavors to assist students and all members of the University to use the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city, throughout the United States, and in various foreign countries.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card which permits direct borrowing from the libraries of the other Consortium institutions.

THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

Charles E. Phillips, LL.B., LL.M., *Chairman Emeritus*

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of all faculties of the colleges and schools of the University.

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Mervyn Elgart
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Stefan Otto Schiff
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George Wilson Smith
*Henry Solomon
Lewis David Solomon
Henry Malcolm Steiner
Phyllis Langton Stewart
John Edmund Ziolkowski

Mary M. Cheh, *Parliamentarian*

* Ex *officio* member
† Chairman of the Executive Committee

ADMISSIONS

The University accepts both men and women. Students are admitted at the beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied by a $20 (for undergraduate study) or $25 (for graduate study) application fee.* The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants are urged to submit the application form and complete credentials well in advance of the semester for which they seek admission. Specific dates are given in each section below.

Acceptance is based on space available and a prediction of potential for successful study. The following criteria are considered: degree or major objective related to rigor of program and grades achieved in secondary school or college, standardized test scores, relationship between grades and test scores, and recommendations.

The right is reserved to refuse admission to any student with an academic record that indicates doubtful ability to succeed in college. In the selection process, there is no discrimination because of sex, race, religion, handicap, national origin, or age.

UNDERGRADUATE ADMISSION†

Forms for application for admission or readmission to undergraduate or nondegree status are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Secondary School Students

Applicants who wish to begin college in a summer session or in the fall semester should apply during the fall term of the senior year in high school. Preference will be given to students who submit applications and required credentials prior to March 1. Students graduating at mid-year who wish to begin college in the spring semester should apply no later than November 1.

Applicants from a secondary school must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

Early Notification—Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after October 1 to students whose applications become complete with secondary school records

* Application fee must be by check or postal money order, payable to George Washington University.

† For detailed admission requirements, see the appropriate college or school in this *Bulletin*. See pages 25-26 for admission requirements for students from foreign institutions.

through the junior year and junior-year test scores, provided these records clearly establish admissibility.

Early Admission Plan –Exceptionally well-prepared students who have completed the junior year in high school may apply for early admission. This plan is designed for students with the emotional maturity, as well as the academic ability and background, necessary for college entrance. In most cases, applicants accepted for early admission have exhausted academic offerings in secondary school to the extent that remaining for the senior year is in the best interests of neither the students nor their schools.

To be considered for early admission, students must:

1. demonstrate superior academic performance through the junior year of high school;
2. meet the entrance requirements of the college or division applied to, by completing all required entrance units with the possible exception of the fourth year of English;
3. have the unqualified recommendation of the secondary school principal or counselor;
4. submit two letters of recommendation (in addition to the counselor's) from teachers who can testify to the student's maturity and general readiness to enter college;
5. submit a letter from a parent or guardian supporting early college entrance;
6. arrange to have SAT or ACT scores sent directly to the University Office of Admissions by the testing agency;
7. take the English Composition Achievement Test, a mathematics or science Achievement Test, and one other Achievement Test (of the student's choice), and arrange to have the scores sent directly to the Office of Admissions by the testing agency.

Transfer Students

Undergraduate students from other institutions should submit applications and required credentials prior to June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions.

To be accepted for transfer, a student must be in good standing as to scholarship and conduct at all post-secondary institutions previously attended. A student who has been academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher education must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, *even though credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (C or better in academic courses from an accredited institution) at the time the application is submitted, his or her high school record and College Entrance Examination Board or ACT test scores must be sent to the Office of Admissions directly from the high school and testing agency.

Advanced Tuition Deposit

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students including those readmitted.

This deposit is not due until May 1 for students entering in the fall semester or until December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.

Advanced Standing and Advanced Placement

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work or examination, credit may be granted for work successfully completed at accredited institutions of higher learning.

Transfer credit must satisfy the requirements for the degree sought as stated in this *Bulletin*. Credit may be accepted provisionally or may require validation by examination or completion of higher-level courses in the same sequence.

Transfer credit will *not* be assigned for: courses completed with a low-pass grade (*D* or the equivalent); *advanced* professional (engineering, education, business) courses unless such courses are required for the student's GW degree (credit for *introductory*-level, professional courses is limited to 12 semester hours in Columbian College); course work completed in vocational/technical programs (e.g., secretarial studies); sub-freshman-level remedial work.

Except for students transferring to the School of Government and Business Administration or to Columbian College of Arts and Sciences from two-year colleges, in which case no more than 60 or 66 semester hours of credit may be assigned, respectively, there is no strict limit to the total amount of credit that may be assigned. However, a student must satisfy the residence and course requirements for the degree sought at George Washington University.

CREDIT BY EXAMINATION, FROM SERVICE SCHOOLS, FROM NONCOLLEGIATE ORGANIZATIONS, AND/OR BY NONTRADITIONAL METHODS

Assuming there is no duplication of course work, a maximum of 30 semester hours of credit may be assigned upon admission to the University for one or any combination of the following except as noted:

College Entrance Examination Board Advanced Placement Tests (APT)—Credit is assigned for examinations passed with scores of four or five on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Examinations passed with scores of three may be considered for credit or placement if the student arranges to have the examination paper sent to the Office of Admissions. The Advanced Placement Tests are administered in the secondary schools in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08541, or Box 1025 Berkeley, Calif. 94701.

College Entrance Examination Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: General and Sub-

ject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 40 subjects.

Credit is assigned for the General Examinations, with the exception of the English composition examination, passed at the 50th percentile or above (1963/1972 college sophomore norms).

Credit is assigned, with some exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy.* A student registered in a degree program at this University must seek departmental and dean's approval *prior* to taking a CLEP Subject Examination for credit to be applied toward the degree. Credit may not be earned by passing the examination after having taken an equivalent course. Arrangements for the examinations are the responsibility of the student and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, N.J. 08541.

Special Departmental Examinations for Undergraduates—Credit may be assigned for Special Departmental Examinations administered by Columbian College departments to students enrolled in all undergraduate divisions of the University; see page 77.

Credit Earned through USAFI and/or DANTES—Except to students enrolled in the School of Government and Business Administration, credit is assigned for approved United States Armed Forces Institute (USAFI) and/or Defense Activity for Nontraditional Education Support (DANTES).

Credit from Service Schools—Except to undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for elected service school instruction received since 1941. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of each course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

Credit for Courses Offered by Noncollegiate Organizations—Except to undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected courses offered by noncollegiate organizations. The University accepts some of the recommendations published in the *National Guide to Credit Recommended for Noncollegiate Courses.* Students who wish to know if courses offered by their employers can be considered for credit should inquire at the Office of Admissions. Courses containing fewer than 30 hours of class instruction are not reviewed. Records, which vary with the sponsoring organization, will be required.

Credit for Courses Offered through Correspondence and Television—Except to undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected courses taught by nontraditional methods, provided that such courses require the student's physical presence during a monitored final examination. Assignment of such credit will require a statement from the

* See page 143 for additional qualifications for applicants to the School of Government and Business Administration.

sponsoring agency that such an examination was a required part of the course.

ADVANCED PLACEMENT OR WAIVER BY EXAMINATION

Advanced placement or waiver of a requirement will be granted on the basis of scores on Achievement Tests of the College Entrance Examination Board as follows:

Achievement Test	Minimum Score	Exemption
English Composition	650	Waives Engl 10
European and/or American History	600	Waives Hist 39-40 and/or 71-72
French	650	Waives a two-year language requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

A score of 58 or above on the Test of Standard Written English will waive English 10.

GRADUATE ADMISSION*

Graduate School of Arts and Sciences—Application forms for admission or readmission are available at the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052. Completed applications and requests for fellowship support must be submitted by February 15 (February 1 for students in clinical psychology and art therapy) for admission in the fall semester and by November 1 for the spring semester. Applications for graduate study are acceptable after these dates for review and possible admission in the corresponding semester only if time permits and if space is available in the program desired.

School of Education and Human Development—Application forms for admission or readmission are available at the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052. Completed application forms should be submitted to that office no later than June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions, unless an extension is granted by the office of the dean.

School of Government and Business Administration—Application forms for admission or readmission are available at the Graduate Admission Office, School of Government and Business Administration, George Washington University, Washington, D.C. 20052. The Application for Graduate Degree Candidacy shows the deadlines for applications to the graduate programs offered by this school.

School of Public and International Affairs—Application forms for admission or readmission are available at the Graduate Admissions Office,

* For detailed admission requirements, see the appropriate college or school in this *Bulletin*. See pages 25-26 for admission requirements for students from foreign institutions.

School of Public and International Affairs, George Washington University, Washington, D.C. 20052. Completed application forms should be submitted to that office no later than March 1 (February 1 for foreign applicants and applicants for graduate fellowships or assistantships). Admission is for the fall semester only. All credentials, including transcripts from all institutions attended, Graduate Record Examination scores, and letters of reference, must be received before the deadline date.

DIVISION OF CONTINUING EDUCATION AND SUMMER SESSIONS

The Office of University Students in the Division of Continuing Education and Summer Sessions makes on-campus credit courses available to *nondegree students*. Application forms for admission to nondegree status in this Division are available from and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052. Completed application forms and any credentials required should be received by the Office of Admissions no later than the Friday before the first day of registration (see Calendar, page 5). To avoid paying a late registration fee, applicants should make sure that all necessary forms and credentials are in the Office of Admissions prior to registration. There is no fee for applying to this Division. For detailed entrance requirements, see page 196.

Registration in a given course may be denied students in this Division when space is needed for degree candidates. Unless working toward a degree elsewhere, students in this Division may not take accounting, business administration, or management science courses.

READMISSION

Previously registered students who wish to resume studies on campus after discontinuing enrollment for one or more semesters (summer sessions excluded) must apply for readmission. Deadlines for readmission applications are the same as those for new applications (see pages 20-21 and 24-25). Students seeking readmission after having attended other institutions of higher education in the interim must have complete official transcripts sent to the appropriate office at this University from all institutions attended elsewhere. Students seeking readmission as degree candidates after previous enrollment in nondegree status must submit all entrance credentials not previously received or required.

Applicants for readmission are subject to the University regulations in effect at the time of readmission.

The application fee is waived for students applying for readmission after previous enrollment as degree candidates at this University if they have not since registered at another institution.

STUDENTS FROM FOREIGN INSTITUTIONS*

Applications, required records, and scores on the Test of English as a Foreign Language (see below) should be received from international stu-

* For detailed admission requirements, see the appropriate college in this *Bulletin*.

dents no later than March 1 (February 1 for some graduate programs) for the fall semester and October 1 for the spring semester.

Required Records

At the time the application is sent, students must have the educational institutions previously attended send directly to the appropriate admissions office (see "Undergraduate Admission," pages 20-21, or "Graduate Admission," pages 24-25) copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by an English translation.

Language Tests

Students whose native language is not English are urged to take the Test of English as a Foreign Language (TOEFL). Those applying to the School of Government and Business Administration or to the physician assistant, cartographic science, or geodesy programs are *required* to submit a TOEFL score. Students are responsible for making arrangements to take the test by addressing inquiries to TOEFL, Box 899, Princeton, N.J. 08541. The completed registration form must be returned well in advance of the semester for which admission is sought. On the application for the TOEFL, students should specify that the scores are to be sent to the appropriate admissions office at this University (see "Undergraduate Admission," pages 20-21, or "Graduate Admission," pages 24-25). Registration for the TOEFL does not constitute application for admission to George Washington University.

An admitted student scoring below 600 on the TOEFL is required to take an English Placement Test for Foreign Students prior to registering at the University. Depending on the results of this test, the student's academic program may be restricted in number and type of courses that can be taken. College credit is not granted for remedial English study.

Financial Certificate

A Financial Certificate must be completed and submitted with the application for admission of all international students planning to study at the University under the authorization of either a student (F) or exchange visitor (J) visa. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66.

TRANSFER WITHIN THE UNIVERSITY

For information concerning transfer from one college, school, or division to another within the University, see page 49.

REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register. Registration in a given course may be denied students in the Division of University and Summer Students when space is needed for degree candidates.

New Student—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the University who was not registered on campus during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before he or she is eligible for registration.

Continuing Student—The student registered on campus in the immediately preceding semester or the summer session preceding the fall semester is eligible to register assuming good standing and enrollment in a continuing program.

Completion of Registration

Registration is not complete until financial settlement is made. Attendance in class is not permitted until registration has been completed.

Registration Changes and Withdrawals (See pages 48-49)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. (see page 54), should consult the program announcements of the other institutions. Consortium registration forms and instructions may be picked up in the Office of the Registrar after obtaining registration

materials. In order to participate in the Consortium program, students must obtain the approval of an advisor and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the Registrar.

FEES AND FINANCIAL REGULATIONS

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1983 summer sessions and the academic year 1983-84.

Tuition Fees

For undergraduate and graduate study in Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, the School of Public and International Affairs, and the Division of Continuing Education and Summer Sessions:

On campus, each semester hour, not to exceed $3,050.00 per semester	$220.00
Off campus, each semester hour	155.00
Summer Sessions, each semester hour	185.00

Payment of tuition for a master's thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional semester hours may be required in accordance with the regulations of the school in which the student is registered.

Students entering doctoral programs in the School of Government and Business Administration in 1983-84 will be charged $15,500 for the entire degree program, to be paid in 10 semiannual installments. Contact the School's Doctoral Programs Office.

University Center Fee (charged all students registered on campus)

Each semester hour, not to exceed $74.00 per semester	7.00

Additional Course Fees

In certain courses additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Residence Hall Fees (see pages 60-61)

Special Fees and Deposits

Application fee (undergraduate degree candidate), nonrefundable	20.00
Application fee (graduate degree candidate), nonrefundable	25.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	200.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period (charged on-campus students only):	
During first week of classes	25.00
During second week of classes	50.00
After second week of classes (if permitted)	100.00
Late-payment fee (see Payment of Fees, below)	15.00
On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)	35.00
Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)	15.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Binding master's thesis	15.00
Microfilm service and printing announcement of final examination (doctoral candidates)	75.00
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
Waiver examination to qualify for advanced placement	5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10.00
Charles E. Smith Center fee (for off-campus degree candidates only) Students registered as degree candidates in a program offered through the Division of Continuing Education and Summer Sessions may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from the Division a signed certificate attesting to degree candidacy	25.00
Statement issued by the Department of Romance Languages and Literatures certifying the degree of oral and/or written fluency and command of the French, Italian, Portuguese, or Spanish languages	25.00
Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the services of the Student and Alumni Career Services Office; (2) the use of the University Library;

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period.

(3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

Postdoctoral Study

Those who have graduated from George Washington University with a Ph.D., Ed.D., D.Sc., D.B.A., or D.P.A. may continue any studies in the University without payment of tuition, and enjoy all University library privileges. Such graduates are required to pay a nominal fee based on the prevailing credit hour rate for one semester hour, as well as the University Center fee, in order to establish their active membership in the University. The use of laboratory space and equipment is contingent upon availability, and the cost of all laboratory or special library material is paid by the graduate. Special arrangements for such privileges must be made with the dean two months in advance of the semester in which the graduate wishes to register. Postdoctoral work taken under this privilege may not be taken for credit.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially

encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35 for on-campus students and $15 for off-campus students.

Students auditing courses are subject to all fees charged to students registered for credit.

Returned Check Policy—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

One-Year Prepaid Tuition Plan—Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1983-84 rate, students choosing this plan would pay $6,050 for two semesters instead of $6,100.

Four-Year Prepaid Tuition Plan—New undergraduate students may elect to pay in advance the total tuition for their full four-year program at the rate applicable to their first year. A payment under this plan for programs beginning with the 1983 fall semester would total $24,400. Refunds to students who do not complete their full four-year programs would be made at the original rate for all remaining full semesters.

Commercial Prepaid and Deferred Payment Plans—Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
The Tuition Plan, Inc., Concord, N.H. 03301

Off-Campus Courses

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a 13-week or longer credit course may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by October 3, and one-third by November 3 (for the fall semester); one-third at the time of registration, one-third by February 7, and one-third by March 6 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance, employee benefits, and partial scholarships must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks, and for all noncredit courses, are payable in full at registration.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college, school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see "Withdrawal," page 48).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal from all courses (on-campus students):*
   Withdrawal dated on or before Saturday of the first week of classes.. 90%
   Withdrawal dated on or before Saturday of the third week of classes. 75%
   Withdrawal dated on or before Saturday of the fifth week of classes.. 50%
   Withdrawal dated after the fifth week of classes ..... None
2. *Partial withdrawal by a part-time student or change in status from a full-time to part-time student*—The above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.
5. *Refund Schedule for Off-Campus Registration:*

   Long Session (or any session longer than 13 weeks)

   Starting date of class plus 6 calendar days 90%
   Starting date of class plus 20 calendar days 75%
   Starting date of class plus 34 calendar days 50%
   Starting date of class plus 35 calendar days to end ..... None

   Intermediate Session (9 weeks, 1 day per week)

   Starting date of class plus 6 calendar days 90%
   Starting date of class plus 13 calendar days 75%
   Starting date of class plus 20 calendar days 50%
   Starting date of class plus 21 calendar days to end ..... None

   Short Session (7 weeks, 2 days per week)

   Starting date of class plus 2 calendar days 90%
   Starting date of class plus 8 calendar days 75%
   Starting date of class plus 15 calendar days 50%
   Starting date of class plus 16 calendar days to end ..... None

   Mini Session (3 weeks)

   Starting date of class plus 1 calendar day 90%
   Starting date of class plus 5 calendar days 75%

* Regulations concerning withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes*.

Starting date of class plus 9 calendar days	**50%**
Starting date of class plus 10 calendar days to end	None

No refund will be made for sessions of less than 21 days.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

FINANCIAL AID

George Washington University offers a program of financial assistance for undergraduate and graduate students. Undergraduate aid consists of two basic types: awards for academic achievement without reference to financial circumstances (honor scholarships) and scholarships, grants, loans, and employment based upon demonstrated financial need. The program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. In addition, loans and resident assistantships not based on financial need are available to undergraduates and graduates alike. Information on the various programs is contained below.

SCHOLARSHIPS AND OTHER FORMS OF AID FOR UNDERGRADUATES

Honor Scholarships—George Washington University honor scholarships of up to half-tuition for the academic year, based entirely upon academic achievement and potential without regard to financial need, are restricted to incoming freshmen.

Need-based Aid—The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the National Direct Student Loan, Pell Grant (formerly Basic Educational Opportunity Grant), Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by February 1 (entering freshmen) or March 1 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by

April 1 for the summer sessions.* A student must reapply for all financial aid, including scholarships, each year.

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

The following scholarships are available to students in Columbian College of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

The George Washington University Board of Trustees Scholarships—Full- and partial-tuition scholarships begin in the fall semester and may be renewed for four successive academic years, provided the holder reapplies by the published deadlines, maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree in any school listed above. Students who have demonstrated outstanding ability in interscholastic speech and debate activities are eligible for the George F. Henigan Scholarships in Debate which are included among these scholarships.

Other Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship
Sherman Page Allen Memorial Scholarship Fund (1966)
Alumni Scholarships
Mary J. Anderson Scholarship (1969)
Athletic Scholarship Fund (1979)
Bache and Company Scholarships
Byron Andrews Scholarship (1920)
Henry N. Brawner, Jr., Foundation Scholarship Fund (1963)
Emma K. Carr Scholarships (1932)
Maria M. Carter Scholarship (1871)
Paul E. Casassa Memorial Foundation Scholarship (1968)
The Chesapeake and Potomac Telephone Company Scholarship (1978)
Columbian Women Scholarship Funds
Victoria Briggs Scholarship Fund (1959)
Elizabeth V. Brown Scholarship Fund (1925)
Grace Ross Chamberlin Scholarship Fund (1932)
College Women's Scholarship Fund (1926)
Columbian Women Members' Scholarship Fund (1961)
Arline Hughes Dufour Scholarship Fund (1961)
Dr. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fund (1964)
Founders of Columbian Women Scholarship Fund (1920)
Elsie E. Green Scholarship Fund (1982)
Rose Lees Hardy Foundation Scholarship Fund (1957)

* Only students who are enrolled in this University for at least six semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for Summer Sessions financial aid, providing that they will graduate at the end of that summer or the following fall semester or are required by their program to attend the summer sessions.

Lillian Young Herron Scholarship Fund (1925)
Nellie Maynard Knapp Scholarship Fund (1915)
Marcia B. Kraft Scholarship Fund (1966)
Janet McWilliams Scholarship Fund (1954)
Marie-Louise Ralph Turner Scholarship Fund (1963)
D.C. Daughters of the American Revolution Scholarship (1952)
Isaac Davis Scholarship (1869)
District of Columbia Institute of Certified Public Accountants Scholarship in Accounting (1964)
Estella Constance Drane Scholarship (1957)
Robert Farnham Scholarship (1871)
Federal Government Accountants Association—Washington, D.C., Chapter —Scholarship in Accounting
Esther Brigham Fisher Scholarship (1951)
George Washington University Tennis Alumni Association Scholarship (1974)
Mildred Green Memorial Scholarship Fund (1959)
Gridiron Foundation of the Gridiron Club Scholarship (1975)
Isadore and Bertha Gudelsky Family Scholarship (1978)
Anna Spicker Hampel Scholarship (1949)
Elma Lewis Harvey Scholarship (1921)
Hazleton Scholarship (1950)
George F. Henigan Scholarships in Debate (1967)
Albert A. and Esther C. Jones Scholarship Fund (1981)
Allen M. Jones Scholarship Fund (1981)
David B. and James L. Karrick, Jr., Scholarship Fund (1968)
Samuel and Elizabeth Kay Scholarships (1969)
Amos Kendall Scholarship (1869)
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)
Mary and Daniel Loughran Scholarship (1976)
Martha's Marathon Residence Hall Scholarship (1969)
Maud E. McPherson Scholarship in English and American Literature (1978)
A. Morehouse Scholarship (1861)
E. K. Morris Education Fund Scholarships (1972)
Helen Marie and Thomas E. Orr Scholarships (1965)
Hardy Pearce Scholarship Fund (1972)
Phi Delta Gamma Scholarships (1956)
Fred B. and Alma D. Pletcher Scholarship Fund (1968)
Levin M. Powell Scholarships (1886)
Research Assistantships in Operations Research and Related Fields
Resident Assistantships
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Mildred Shott Scholarship Fund (1981)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)
U.S. Office of Education Traineeships (1964)
University Players Scholarship in Memory of L. Poe Leggette (1968)

William Walker Scholarship (1824)
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)
John Withington Scholarship (1830)
Women's Physical Education Alumnae Association Scholarship (1964)
William G. Woodford Scholarship (1969)
Ellen Woodhull Scholarship (1919)
Zonta Club Scholarship (1950)

Grants

The following funds have been established to meet the special needs of disadvantaged students from the District of Columbia inner-city and the Washington metropolitan area.

George Washington University's Educational Opportunity Program Tuition Grants (1968)
Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
Marriott Foundation Grant (1968)

ASSISTANTSHIPS, FELLOWSHIPS, AND OTHER FORMS OF AID FOR GRADUATE STUDENTS

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the dean of the school concerned, and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted no later than February 1 preceding the academic year for which the award is made. Application for admission to graduate study is a prerequisite for consideration.

Assistantships

Research Assistantships—Available in the fields of computer science, economics, operations research, psychology, sociology, and statistics through the Graduate School of Arts and Sciences and its participation in sponsored programs with the Consortium of Universities of the Washington Metropolitan Area.

Graduate Teaching Assistantships—Available to graduate students in master's and doctoral programs in most departments of the University. A graduate teaching assistant receives financial compensation for a designated unit of service to the assistant's major department of instruction.

Other Assistantships—
Health Services Administration Research Assistantships
National League of Cities/George Washington University Assistantship
Urban Affairs Assistantship

Fellowships, Internships, Traineeships, Special Programs

The following fellowships, internships, and traineeships are available to students in the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs. The Uni-

versity also offers many other fellowships which are available to students in these colleges and schools.

University Fellowships—Available to graduate students in master's and doctoral programs in most departments of the University. Fellowships are based on scholarship and each fellow may receive a stipend, tuition allowance, and course fees.

Research Traineeships—Available under numerous sponsored programs in a number of departments. Currently, the basic medical science departments and the Departments of Psychology and Speech and Drama offer such programs. Stipends vary; information is available from the departments and the Office of the Dean of the Graduate School of Arts and Sciences.

Other Fellowships, Internships, Traineeships, and Special Programs—

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Fellowship
Robert A. Aleshire Fellowship Fund (1971)
American Association of Collegiate Schools of Business Fellowship
American Civilization Fellowships
American Civilization Internships (Smithsonian Institution-George Washington University Cooperative Program)
American Iron and Steel Institute Fellowship
Arthur Anderson & Co. Doctoral Fellowship
Aryamehr Research Fellowships
Winfield Scott Blaney Fellowship in International Affairs (1961)
Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning (1973)
Thomas Alva Edison Fellowship
Elementary Teacher Education Internships
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics
Health Services Administration Fellowships
Richard D. Irwin Doctoral Fellowships
Rita H. Keller Scottish Rite Scholarships and Fellowship Fund (1981)
Isabella Osborn King Research Fellowships (1927)
Loula D. Lasker Fellowships in Housing, City Planning, or Urban Renewal
George McCandlish Fellowship in American Literature (1980)
Mellon Foundation Fellowships
Minorities in Planning and Related Professions Program
National Association of Purchasing Management Fellowship
National Historical Publications Commission-George Washington University Cooperative Research Fellowships
National Science Foundation Graduate Fellowships
Resources for the Future, Inc., Fellowship Prize
Rose Bibliography Internships
Thomas Bradford Sanders Fellowships (1928)
Scottish Rite Foundation Fellowships
U.S. Office of Education Fellowships (1964)
U.S. Public Health Service Traineeships
U.S. Public Health Service Traineeships in Comprehensive Health Planning
Urban Studies Fellowships of the Department of Housing and Urban Development
Urban Transportation Center Fellowship

Ronald Barbour Weintraub Research Fellowship in Biological Sciences (1980)

Graduate Scholarships

Armed Forces Health Professions Scholarship Program (The Uniformed Services Health Professions Revitalization Act of 1972—Public Law 92-426)
Barbee Sculptor Scholarship (1975)
Emma K. Carr Scholarships (1932)
District of Columbia Institute of Certified Public Accountants Scholarship in Accounting (1964)
Genetics Graduate Scholarship (1979)
Albert A. and Esther C. Jones Scholarship Fund (1981)
Allen M. Jones Scholarship Fund
Myron L. Loe Scholarship Fund (1975)
Mary and Daniel Loughran Graduate Scholarship (1976)
Foster G. McGaw Scholarship in Health Care Administration (1971)
Paul Pearson Scholarship Fund (1940)
Phi Delta Gamma Scholarship Fund (1968)
Voorhees Scholarships
Wolcott Foundation Scholarships

Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others which may be used in support of graduate study is available at the Graduate Fellowship Information Center, 2130 H St., N.W., Room 621D, for students enrolled at George Washington University. Information is also available on distinguished programs such as the Rhodes, Marshall, National Science Foundation, Fulbright, Luce, and Rotary International, as well as many others.

As deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

FORMS OF AID AVAILABLE TO UNDERGRADUATE AND GRADUATE STUDENTS

Assistantships

Research Assistantships in Operations Research and Related Fields—Available to graduates, and to undergraduates on the junior and senior levels, in any school of the University. Research assistants are expected to work 20 hours a week conducting research in support of an established research program, in programming or in conducting individual research on an approved research project. Stipends range up to $8,000, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part-time, and staff members are required to enroll as full-time students in degree granting programs. Further information may be obtained from the Office of the Director of Housing.

Loan Funds

The following loan funds are available to undergraduate and/or graduate students in Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs. A separate application must be submitted for all loan programs. Applications for the National Direct Student Loan should be filed no later than April 1 for the following academic year. Complete information is contained in the student financial aid pamphlet which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

American Medical Association Nursing Home Administration Loan Fund
George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
W. K. Kellogg Foundation Hospital Administration Loan Fund
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
Hiram Miller Stout Memorial Loan Fund (1973)
University Student Emergency Loan Fund

Guaranteed Student Loan Program—George Washington University is an eligible participant in the Federally Insured/State Guaranteed Student Loan Program. Undergraduate students may apply for a maximum of $2,500 per year. Graduate students may apply for a maximum of $5,000 per year. Students who intend to use the loan for payment of tuition at registration should submit an application, as well as all required supporting documents, no later than June 1.

Parents Loan for Undergraduate Students/Graduate Students—George Washington University is also an eligible participant in the Parents Loan for Undergraduate Students Program (PLUS), sometimes referred to as the Auxilliary Loan to Assist Students. The interest rate on the loan may be either 12 or 14%, depending upon the fluctuation of the interest rate on U.S. Treasury Bills. Repayment begins 60 days after the disbursement of the check. Parents of dependent undergraduate students may apply for up to $3,000 per year. Independent undergraduate students may apply for up to $2,500 per year under the PLUS and GSL programs combined. Graduate students may apply for up to $3,000 per year. Students who intend to use the loan for payment of tuition at registration should submit an application no later than June 1.

Student Employment

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Student and Alumni Career Services Center maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Career Services Center for interviews and referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, above.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

We suggest that students who wish to study in the United States have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is approximately $10,800. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

PRIZES

Accounting Prizes—Three prizes for academic excellence awarded annually by the Department of Accounting—two at the undergraduate level and one at the Master of Accounting level.

Morris M. Aein Memorial Prize—Awarded to a deserving student for excellence in drawing.

Alpha Chi Sigma Prize—Awarded annually by the Alpha Pi Chapter to the student who has attained the highest academic record in courses in chemistry. The name and year of graduation of the student is inscribed on a bronze plaque. The winner must have had at least 16 hours in chemistry, including the final semester at this University.

American Chemical Society Prize—Awarded to an undergraduate student who has completed the junior year and who has demonstrated excellence in analytic chemistry.

American Institute of Chemists Prize—A medal awarded annually to the graduating student majoring in chemistry who excels in scholarship, integrity, and leadership.

Department of Art Prizes—Two prizes—one for a senior in art history and one for a senior in the fine arts—awarded annually to the most promising students, as determined by the departmental faculty.

Franz Bader Prize—Awarded to a student for excellence in art history and criticism.

William C. Barbee Prize—Awarded to a deserving student for excellence in sculptural ceramics.

Perry Botwin Prize—Awarded annually to an outstanding senior in the program in special education of the School of Education and Human Development.

The Walter G. Bryte, Jr., Achievement Award—Provided by Walter G. Bryte, Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science at George Washington University. The award is presented annually primarily to that undergraduate residence hall, secondarily to any other activity at the University, which has shown under the leadership of its elected or designated head, the most improvement or excellence in its support of the principles and aims of the United States of America and George Washington University. The hall or other activity will be awarded a cash prize, and the name of its leader and the hall or activity will be engraved on a silver trophy.

Buka Family Prize—Provided by Ruth Buka in honor of her parents, Georg and Rosa Buka, and her sister, Hilde Buka-Lacour. It is awarded to the most outstanding student in the Department of Germanic Languages and Literatures.

Byrne Thurtell Burns Memorial Prize—Awarded to the senior majoring in chemistry who shows the greatest proficiency in organic chemistry, as evidenced by a comprehensive examination, and who possesses such qualifications of mind, character, and personality as to give promise of future achievement.

Business Administration Prize—Awarded annually by the Department of Business Administration to the outstanding graduating senior in business administration on the basis of scholarship, leadership and service to the University.

Wilbur J. Carr Prize—Established in 1962 by Edith K. Carr, former Trustee of the University, in memory of her distinguished husband, who was graduated from the School of Comparative Jurisprudence and Diplomacy in 1899. It is awarded annually to that student in the graduating class of the University who has demonstrated outstanding ability in the study of international affairs and who has given evidence of possessing in marked degree the qualities which produce the good citizen and the dedicated public servant.

Chemical Rubber Company Freshman Chemistry Achievement Prize—*A Handbook of Chemistry and Physics* awarded annually to the freshman student who has demonstrated the greatest achievement in Chemistry 15-16.

Chemical Society of Washington Prize—Awarded to an outstanding undergraduate in the junior year who is majoring in Chemistry.

Astere E. Claeyssens Prize—Established in 1981 by the Trustees of the Bess and Arthur Dick Family Foundation. It is awarded for the best original work in playwriting by a student enrolled in the University.

Jerome Cornfield Memorial Prize—Awarded annually to the student who has written the best Ph.D. dissertation in the Department of Statistics.

Bertice Cornish Prize—Awarded annually to an outstanding student completing a graduate program in special education.

John Henry Cowles Prizes—Two prizes, established by John H. Cowles, Grand Commander of the Supreme Council of Thirty-third Degree (Mother Council of the World) of the Ancient and Accepted Scottish Rite of Freemasonry, Southern Jurisdiction of the United States of America. Awarded annually to the senior in the School of Government and Business Administration and to the senior in the School of Public and International Affairs with the highest academic averages.

DeWitt Clinton Croissant Prize—Awarded annually to the undergraduate student enrolled in a course in drama or active in University dramatics who submits to the English Department the best essay on drama or the theater.

E.K. Cutter Prize—Established by Marion Kendall Cutter "for excellence in the study of English." Awarded to the member of the graduating class whose record in English, combined with general excellence, shows most marked aptitude for and attainment in English studies.

Isaac Davis Prizes—Established in 1847 and awarded annually to the three seniors who have made the greatest progress in public speaking while enrolled in the University. Awards are to be determined by a public-speaking contest in which the participants deliver original orations. Only members of the senior class of Columbian College of Arts and Sciences who are candidates for the degree of Bachelor of Arts or Bachelor of Science are eligible to compete.

Dimock Gallery Prize—Purchase award presented for creative achievement in the fine arts.

Henry Grattan Doyle Memorial Prize—Established in memory of Henry Grattan Doyle, a former Dean of Columbian College. Awarded annually to an outstanding senior for excellence in Spanish.

Elton Prize—Established by the Reverend Romeo Elton, of Exeter, England, and awarded annually to the student with the highest average in the most advanced course in the Greek language and literature.

Jesse Frederick Essary Prize in Journalism—Established by Helen Essary Murphy and awarded annually to a student who has given promise of sound citizenship and who submits the best printed and published evidence of ability in "forthright reporting" and good journalistic writing, in a student publication or elsewhere.

Jessie Fant Evans Prize—A bequest of Joshua Evans, Jr., in 1971, in recognition of his wife's distinguished record at and service to the University, on whose Board of Trustees she served as the first woman member. Awarded annually to an outstanding senior student in a contemporary history course.

Joshua Evans III Prize in Political and Social Science—A memorial prize "established by friends because of an outstanding life." Awarded an-

nually to that student in the graduating class "who has demonstrated his/her signal ability in the social and political sciences and who has given promise of the interpretation of that ability in good citizenship among his/her fellows."

Willie E. Fitch Prize—Established by James E. Fitch in memory of his son. Awarded annually to a senior student for the best examination in chemistry.

Charles E. Gauss Prize—Established in honor of Charles E. Gauss, Elton Professor of Philosophy from 1945 to 1964. Awarded annually to a graduating senior for excellence in philosophy.

Ginns Muth Company Prize—Awarded for creative achievement in the field of visual communication.

Alice Douglas Goddard Prize—A memorial established by Frederick Joseph Goddard, of Georgetown, D.C. Awarded annually to the senior student making the highest average in American literature.

Edward Carrington Goddard Prize—Established by Mary Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Georgetown, D.C., in memory of Edward Carrington Goddard, class of 1881. Awarded to the junior or senior student making the highest average in the French language and literature.

Morgan Richardson Goddard Prize—A memorial established by Mary Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Georgetown, D.C. Awarded to the junior or senior student making the highest average in the following fields: business administration, economics, international business, or public accounting.

Gardiner G. Hubbard Memorial Prize in United States History—Established by Gertrude M. Hubbard in memory of her husband and awarded annually to that member of the graduating class majoring in history who has maintained the highest standing in courses in United States history.

International Business Prize—Two prizes awarded annually by the School of Government and Business Administration to students specializing in international business, one awarded to a graduating senior and one awarded to a graduate student.

Elmer Louis Kayser Prize—Established by Paul and Elizabeth Rutheiser to be awarded annually by the Department of History for the best thesis in history submitted by a candidate for the degree of Master of Arts.

David Lloyd Kreeger Prizes in Art—Seven prizes given by Mr. Kreeger, five in the fine arts and two in art history (including museology). Fine arts prizes are awarded to a senior or graduate student in painting, sculpture, printmaking, ceramics, and photography. One prize in art history is awarded to a senior and one to a graduate student. Candidates for the prizes must submit original papers or works of art. Winners are selected by distinguished representatives of the field of art in the Washington, D.C., area.

Minna Mirin Kullback Memorial Prize—Established in 1968 by Solomon Kullback in memory of his wife. Awarded annually by a committee of faculty members of the Department of Statistics to a full-time undergraduate or graduate student majoring in statistics, who will have completed 18 semester hours of statistics courses by the end of the spring semester.

John Francis Latimer Prize in Classics—Established in 1973. Awarded to a graduating senior who has made the most outstanding record as a major in the Department of Classics.

Hilda Haves Manchester Prize in Sociology—Established in honor of Hilda Haves Manchester, B.A. 1932, an outstanding student whose major field was sociology. Awarded annually by Columbian College of Arts and Sciences to the senior student majoring in sociology who has the highest scholastic record.

Vivian Nellis Memorial Prize—Awarded to a student in the English Department who has shown special promise in the field of creative writing.

Phi Delta Kappa Prize—Awarded annually by the George Washington University Chapter to an outstanding senior in a teacher education program in the School of Education and Human Development.

Phi Delta Kappa Research Prize—Awarded annually by the George Washington University Chapter to a graduate student, for an outstanding research project.

Phi Eta Sigma Prize—A choice book selected from the field of the recipient's major, awarded annually by the George Washington University Chapter to the student attaining the highest scholastic average in the first full semester of work. The winner's name is engraved on a plaque in the Office of the Dean of Columbian College of Arts and Sciences.

Pi Lambda Theta Prize—Awarded annually by Alpha Theta Chapter to an outstanding senior in a teacher education program in the School of Education and Human Development.

Psi Chi Prizes—Two prizes awarded annually by the George Washington University Chapter to the best undergraduate student in experimental psychology and to the M.A. degree candidate or second-year graduate student submitting the best thesis or research project in psychology.

Ruggles Prize—Established by Professor William Ruggles in 1859, awarded annually to a candidate for a bachelor's degree for excellence in mathematics.

The Jack and Anne Ryan Award in Health Services Administration—Awarded annually to that Health Services Administration student who displays excellence of analysis and writing skills in the preparation of a paper on a topic in health services administration.

Hermann and Johanna Richter Schoenfeld Prize—Established in grateful appreciation of the inspired teaching and devotion to his students of Dr. Hermann Schoenfeld, who for more than 20 years until his death in 1926 headed the Department of German. Hermann Schoenfeld, Ph.D., LL.D., was widely recognized as a scholar of distinction whose presence on the faculty added prestige to the University. This prize is given annually to a member of the graduating class for excellence in historical and cultural phases of German studies.

Julian H. Singman Prize—Awarded for creative achievement in the field of design.

Society of Colonial Wars in the District of Columbia Prize—A cash prize awarded to a candidate for a graduate degree who, in the judgment of the faculty of the Department of History, submits a thesis or dissertation demonstrating excellence in historical research in American Colonial history. The University reserves the right to withhold the award if no

thesis or dissertation attaining the required degree of excellence is submitted.

Staughton Prize—Established by the Reverend Romeo Elton and awarded annually to the student making the best record in the most advanced courses in the Latin language and literature.

Alfred E. Steck Memorial Prize—Awarded for proven excellence in the field of sculpture.

James MacBride Sterrett, Jr., Prize—Established in 1911 by Professor Sterrett in memory of his son. Awarded annually to the student who obtains the highest average in Physics 1 and 2.

Charles Clinton Swisher Historical Club Prize—Established in 1936 by the Charles Clinton Swisher Historical Club and augmented in 1941 by the bequest of Professor Swisher. Awarded annually to the student who submits the best essay covering some phase of medieval history.

James H. Taylor Graduate Mathematics Prize—Established in memory of James H. Taylor, former Professor of Mathematics at the University. Awarded annually to a graduate student for outstanding performance in mathematics.

Patricia M. Toel Memorial Prize—Awarded annually to a graduate student in photography to recognize outstanding achievement.

Benjamin D. Van Evera Memorial Prize—Awarded annually to that Graduate Teaching Fellow in Chemistry selected as the most effective teacher during the current academic year.

The Wall Street Journal Leadership Prize—Awarded annually to a graduating senior with a major field of study in finance within the Bachelor of Business Administration degree, for outstanding academic performance and service to the University.

Thomas F. Walsh Prize—Established in 1901 and awarded annually to the student who submits the best essay in Irish history.

The Washington Society of Investment Analysts Award—A $500 award given to a full-time candidate for the Master of Business Administration degree who is interested in finance and investments, has a high undergraduate academic record, and demonstrates financial need.

Alexander Wilbourne Weddell Prize—Established in 1923 by Virginia Chase Weddell in memory of her husband. Awarded annually to a degree candidate who writes the best essay on "the promotion of peace among the nations of the world." The prize essays shall become the property of the University and shall not be printed or published without the written consent of the University. The University reserves the right to withhold the award if no essay attaining the required degree of excellence is submitted.

Women's Transportation Seminar Prize—Awarded annually by the Women's Transportation Seminar to an outstanding student specializing in transportation in the School of Government and Business Administration.

REGULATIONS

Students enrolled in the University are required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which registered.

Students who withdraw or are suspended, or who, for any other reason, are not registered at the University for one semester or more, may re-enter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the Faculty) for subsequent registration in the University.

ATTENDANCE

Students may not attend classes until registration is completed and fees due are paid. They may attend only those classes for which they are registered. Regular attendance is expected. Students may be dropped from any course for undue absence.

SCHOLARSHIP REQUIREMENTS

Students who fail to maintain the scholarship requirements of the college, school, or division in which registered may be dismissed from the University.

Grades

Grades are mailed to students through the Office of the Registrar at the close of each semester. They are not given out by instructors.

UNDERGRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal; *P*, Pass; *NP*, No Pass. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat a course in which a grade of *D* or better was received, unless required to do so by the department concerned. A written statement, indicating that the student is required to repeat the course, must be submitted to the student's dean by the appropriate department chairman.

GRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *CR*, Credit; *F*, Fail; *I*, Incomplete; *IP*, Progress; *P*, Pass; *NP*, No Pass; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. Except

for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat a course in which a grade of *C* or above was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the student's dean by the appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol *I* (Incomplete), the symbol *W* (Authorized Withdrawal), or the symbol *Z* (Failure because of unauthorized withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete from a student's record, consult the regulations of the college, school, or division concerned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on his or her record in this University. Quality points are computed from grades as follows: *A*, four points; *B*, three points: *C*, two points; *D*, one point; *F* and *Z*, no points, for each semester hour for which the student has registered. Courses marked *CR*, *I*, *IP*, *P*, *NP*, or *W* are not considered in determining the index, except that courses marked *I* will be considered when a final grade is recorded. With the exception of Consortium courses, grades in courses taken at other institutions are not considered in computing the quality-point index.

Final Examinations

Final examinations for undergraduate courses are scheduled by the Office of the Registrar. Examinations for courses numbered 201 or above are scheduled, if desired, by the individual department or instructor.

Academic Dishonesty

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the com-

munity are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

WITHDRAWAL

Withdrawal from a course or from the University requires the permission of the dean of the college, school, or division in which the student is registered. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see "Payment of Fees").

Each college, school, and division of the University sets deadline dates for each semester concerning withdrawal. Withdrawal between these dates and the end of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be met by the student. Such unauthorized withdrawal will result in the recording of a failing grade for the course or courses.

CHANGES IN PROGRAM OF STUDY

Changes within a College, School, or Division—A student may not substitute one course for another, drop courses (see "Withdrawal" above), change status from credit to audit or from audit to credit without the approval of the dean of the college, school, or division in which registered.

Change from one section to another of the same course may be made with the approval of the dean and the department concerned.

Change from one major field to another within the same college or school may be made with the approval of the dean.

Transfer within the University—Application for transfer to another college, school, or division must be made to the appropriate admitting office on the form provided by the deans concerned. Transfer from the appropriate preprofessional curriculum in Columbian College to bachelor's degree candidacy in the School of Public and International Affairs may take place upon the completion of 60 or more semester hours of course work and of the necessary procedures required by the particular school.

With the exception of the School of Government and Business Administration which limits a student to 15 semester hours earned in nonmatriculated status, a maximum of 45 semester hours earned in the Division of Continuing Education and Summer Sessions may be applied toward a bachelor's degree in the other degree-granting colleges or schools of the University.

Students transferring within the University are advised to study carefully the requirements listed below under the heading "Graduation Requirements," and to note that, unless otherwise specified, in all undergraduate divisions, 30 semester hours, including at least 12 semester hours in the major field, must be completed while registered in the school or college from which the degree is sought. Upon transfer the student should consult the dean concerned and understand clearly the requirements which must be fulfilled.

CREDIT

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so earned toward graduation from this University, must first secure the written approval of their dean. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are

ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the dean to inactive status (see below) he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of the degree, he or she may petition the dean for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

INACTIVE STATUS

Under the regulations established by each school and college, a student may be considered in continuous pursuit of the degree while not enrolled in courses at the University when engaged in the following: cooperative engineering work semester; "year abroad program"; attendance at another institution with prior approval to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received; or non-course instructional activities unique to the particular school or college.

Students must request to be enrolled in inactive status, in advance of the year or semester concerned, and be granted approval by their dean for the specific activity desired. This status is generally limited to one year; no fees are assessed students while in this status.

GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence and other requirements for the degree for which registered; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship—The student must meet the scholarship requirements for the particular degree for which registered.

Curriculum—Minimum curriculum requirements for each degree are stated under the college or school offering work in preparation for the degree.

Residence—Unless otherwise specified, in all undergraduate divisions of the University, a minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the school or college from which the degree is sought. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean of the college or school concerned to pursue work elsewhere, the work of the senior or final year must be completed in the college or school from which the degree is sought.

The graduate student must meet the residence requirements for the particular degree for which registered.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Thesis or Dissertation—A thesis or dissertation submitted in partial fulfillment of requirements for a degree must be presented in its final form to the dean of the college or school concerned no later than the date specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation. See the appropriate college or school in this bulletin for regulations governing theses and dissertations.

HONORS

WITH DISTINCTION

In all undergraduate divisions of the University a baccalaureate degree may be conferred "With Distinction," at the discretion of the faculty, if a student meets the specific requirements of the college or school as follows:

1. Columbian College of Arts and Sciences or School of Public and International Affairs—the attainment of the grades of *A* in 60 per cent of the courses taken at GW; or

2. School of Education and Human Development or School of Government and Business Administration—the attainment of a quality-point index of 3.50 or higher in all course work taken at GW.

To be eligible a student must have completed at this institution at least one-half of the courses required for the degree.

SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of the graduating class for outstanding achievement in the student's major field on recommendation of the major department. The student must fulfill all of the following requirements:

1. Candidacy for Special Honors must be approved by the faculty member representing the major department or field not later than the beginning of the senior year.
2. Such other conditions as may be set at the time the candidacy is approved must be met.
3. At least one-half of the courses required for the degree must have been completed at GW.
4. The specific requirement of the college or school in which registered must be fulfilled, as follows: (a) Columbian College of Arts and Sciences or the School of Public and International Affairs—grades of *A* or *B* in 50 per cent of the courses taken at GW; or (b) the School of Education and Human Development or the School of Government and Business Administration—a quality-point index of at least 3.0 on all course work taken at GW.

THE LIBRARY

All students registered in the University have the privilege of using the University Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book which circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open, except that they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

ASSOCIATIONS AND SERVICES

CONSORTIUM OF UNIVERSITIES OF THE WASHINGTON METROPOLITAN AREA, INC.

The universities in Washington, D.C.—American University, Catholic University of America, George Washington University, Georgetown University, Howard University, and the University of the District of Columbia—are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (such as music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all the participating institutions. See pages 27-28 for information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar of the institution in which the student is enrolled. Students register and pay tuition at their own institutions for all Consortium courses; course fees are payable to the visited institutions.

THE READING CENTER

Director F.E. Hesser

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults. Instruction is available on an individual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

Fees—Individuals should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center, Building C, Suite 429, 2201 G Street, N.W.

THE SPEECH AND HEARING CENTER

Director of Speech-Language Pathology and Audiology J.W. Hillis

The Speech and Hearing Center offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech; and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, neurological impairment, mental retardation, and environmental factors.

CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

Director F. William Rambo

The Center for Academic and Administrative Computing (CAAC) is located in the Academic Center, 801 22nd St., N.W. CAAC facilities are normally available 24 hours a day during the academic year, to all faculty, staff, and students.

CAAC encourages interest in computers by providing computing facilities and by offering short courses and technical assistance. Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request and without charge.

CAAC maintains two IBM 4341's (VM/SP and OS/VS1). A full range of compilers and application software packages is available including (but not limited to) CMS, XEDIT, FORTRAN, COBOL, PL/1, PASCAL, APL, SPSS, SAS, BMDP, ASSEMBLER, ASSIST, and SCRIPT. In addition, CAAC provides an easy-to-learn, terminal-based, text-editing system on a PDP 11-70 computer.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

GENERAL ALUMNI ASSOCIATION

President Nancy B. Dudley

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Membership in the Association is conveyed automatically to anyone who has been graduated from any school or division of the University. Anyone who has earned 15 credit hours or the equivalent at the University and whose class has graduated is eligible for membership; in the case of the Division of Continuing Education and Summer Session students, however, only the "15 credit hours earned" requirement and not the "graduation of the class" requirement applies. Graduates of certificate programs of the Center for Continuing Education in Washington are eligible. Any persons who are or have been members of the University's Board of Trustees,

faculty, or administrative staff, as well as others determined to qualify by the Governing Board, are eligible for membership in the Association.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

VETERANS BENEFITS

The Veterans Counselor's office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

ROTC

George Washington University students may enroll through the Consortium in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Limited credit for such courses (primarily advanced ROTC) may be assigned for electives to meet degree requirements at George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

STUDENT LIFE

Vice President for Student and Alumni Affairs William Smith, Jr.
Assistant Vice President for Campus Life John Perkins

The Office of the Vice President for Student and Alumni Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented

through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Services, Services for Students with Disabilities, Student Activities, Student and Alumni Career Services, and Student Health Service. The Office of the Vice President for Student and Alumni Affairs is also responsible for programs and services for alumni through the Office of Alumni Relations.

OFFICE OF THE DEAN OF STUDENTS

Dean of Students Gail Short Hanson
Assistant Dean of Students Cheryl Beil

The Office of the Dean of Students provides counseling and information for students, and assists in program development for the Division of Student and Alumni Affairs. Staff members are well-informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students is responsible for the services and programs offered by the Counseling Center, Educational Opportunity Program, International Services, Services for Students with Disabilities, Student Health Service, and the Student and Alumni Career Services Center. The Dean of Students' office is located on the fourth floor of Rice Hall.

Counseling Center

Director E. Lakin Phillips
Assistant Director Diane M. DePalma

The Counseling Center fosters personal growth and development and helps individuals with personal, social, career, and study problems that interfere with their educational goals. University students, staff, and faculty are eligible for services. These include: (1) short-term individual counseling and art therapy for personal problems (e.g., academic pressures, relationship issues, family problems, concerns about sex, self-esteem); (2) group counseling for personal problems and special focus problems; (3) educational/vocational counseling and assessment to facilitate choices of majors and careers; (4) workshops designed to facilitate students' learning about themselves and developing new ways of interacting with others (e.g., assertiveness training, couples communication, management training, study skills seminars); (5) consultation with faculty, staff, and student groups about their special needs in designing programs to improve the campus environment.

The Center administers the Miller Analogies Test, GWU admissions tests, and special assessments for business and industry. Its Community Vocational Counseling Services provides educational/vocational counseling to GWU alumni and the greater Washington community.

Students, staff, and faculty may schedule a cost-free initial interview from 9 a.m. to 5 p.m., Monday through Thursday, and from 1 to 5 p.m. on

Fridays. For most services a modest fee per appointment is charged. An additional materials fee is charged for test batteries. Fee adjustments can be made if financial need is a factor. Disabled students are asked to call ahead so that arrangements can be made to adapt services or to meet at an accessible site. The Counseling Center is located at 718 21st Street, N.W.

International Services

Director Patricia McMillen
Assistant Director Morris Jackson

International students, scholars, faculty, and staff are provided assistance through International Services. The staff offers immigration assistance and information on government requirements and regulations specific to the international community; orientation programs, both single sessions and continuous programs, to help with adjustment to living and studying in the United States; and advising and counseling for a variety of personal problems, including cultural adjustment, living conditions, budgets, academic concerns, and financial aid. International Services is located at 2129 G Street, N.W.

Educational Opportunity Program

Director Ronald Whitmore
Assistant Director Donald Ross

The Educational Opportunity Program is designed to provide selected District of Columbia high school graduates and other qualified District residents with financial and personal support as well as academic assistance to help them pursue undergraduate degree work at George Washington University. The Program office is located at 2127 G Street, N.W.

Services for Students with Disabilities

Director Linda Donnels
Assistant to the Director Kathleen Desmond

The Office of Services for Students with Disabilities works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extracurricular life of the campus are provided for them through University or community resources. The office is located on the fourth floor of Rice Hall.

Student and Alumni Career Services Center

Director Kathy Sims
Assistant Director Barbara Fitzgerald-McClain
Counselor Lynn H. Clark

The Career Services Center provides career planning and job-seeking assistance to students and alumni. Programs and services include: full-time and part-time job vacancy listings; career counseling, workshops (e.g., organizing job searches, resume and letter writing, effective inter-

viewing, negotiating for salary); a resource library of career field and employer literature; on-campus interviews for students within one year of graduation; a resume referral service; resume critiques; a weekly job listings publication, the *Job Opportunities Bulletin;* and a credentials service that supports employment and graduate/professional school applications. The Center is located in the Academic Center, Suite T-509, 801 22nd Street, N.W.

Student Health Service

Director Isabel Kuperschmit, M.D.
Coordinator Janet Garber

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician's assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

HEALTH AND ACCIDENT INSURANCE

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should contact the Student Health Service or Office of the Dean of Students.

HOUSING AND RESIDENCE LIFE

Director Ann Webster
Associate Director David McElveen
Assistant Directors Kathleen Jordan, Sherri McGee, Heidi Bruce

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washing-

ton University, Washington, D.C. 20052. Information concerning off-campus housing near the University also may be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive, with the notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a $200 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room or apartment charge. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester, unless the student elects the 10-month payment plan. Please check with the Student Accounts Office for the latter option.

1983-84 Residence Hall Rates Per Person for Two Semesters*

For Men:

Calhoun Hall
double room $2,060
triple room 2,000

For Women:

Strong Hall
single room 2,230
double room 2,060
triple room 2,000

For Men and Women:

Crawford Hall
double room 2,060

†Everglades Hall (limited to juniors and seniors)
apartment for two persons ..... 2,280 or 2,170

Building JJ (limited to sophomores, juniors, and seniors)
apartment for 4 or 6 persons 2,140

Francis Scott Key Hall (limited to juniors and seniors)
apartment for one person 2,380
apartment for two persons 2,270
apartment for three persons ..... 2,270 or 2,140

Madison Hall
double room 2,060
triple room 2,000

†Milton Hall (limited to juniors and seniors)
apartment for two persons ..... 2,290 or 2,190
apartment for three persons 2,080

Mitchell Hall
single room 2,230

†Munson Hall (limited to juniors and seniors)
apartment for two persons ..... 2,290 or 2,190
apartment for three persons 2,080

* Residence hall prices and allocation are subject to change.
† Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate.

Thurston Hall	
double room, triple room, room for four	2,060
suite for six	1,930

Food Service

Resident freshmen and sophomores are required to choose one of the following three food service plans: the seven-day, 19 meals per week plan, at the rate of $1,700* for the academic year; the any 14 meals per week plan for $1,630* for the academic year; or the any 10 meals per week plan at $1,570* for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students, and for all students assigned to apartments. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second-floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash-equivalency basis in the Marvin Center first-floor cafeteria and George's.

Students who observe the Jewish dietary laws can write to make arrangements with the GW Housing and Residence Life Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

ALUMNI RELATIONS OFFICE

Director Sandra Hunter Lear

The Alumni Relations Office, in conjunction with the General Alumni Association, makes available to alumni and their families an annual program of services and educational and cultural events. Students are invited to participate in the programs held on campus. In addition, the Alumni Relations Office sponsors or co-sponsors programs and services designed specifically for the student body.

Alumni are encouraged to inquire about available services and programs at the Alumni Relations Office, and to keep the Office informed of any changes in address or occupation.

The Alumni Relations Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

CLOYD HECK MARVIN CENTER

Director Boris Bell
Assistant Director Donald Cotter

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; by the academic departments that include performing arts; and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the

* Food service prices are subject to change.

Center by working closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT ACTIVITIES OFFICE

Director Claudia Derricotte
Assistant Directors Michael Elmore, Randall Mason

The Student Activities Office assists individual students and organizations in program development, campus leadership development, and participation in special projects, both within the University community and the community at large. The Office serves as a clearinghouse for activities information, registers and advises student organizations, and informs the University community of activities and programs through monthly and annual publications. The Student Activities Office is also responsible for coordinating the orientation program for new students, and for planning supplemental development programs for graduate and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

Additional information about the numerous student organizations and committees is contained in the *Student Handbook*, compiled by and available at the Student Activities Office in the Marvin Center.

Student Government

The George Washington University Student Association is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The Student Association provides various services for students such as an academic evaluation, a student directory, and the Student Advocate Service. Further information can be obtained from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped develop policies and programs beneficial to students and to the total University community.

Student Organizations

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 200 organizations on campus covering a broad spectrum of interests including academic, professional, international, cultural, political, service, sports, hobbies, recreational, religious and meditative, as well as social fraternities and sororities. Academic honor societies include Phi Beta Kappa and Sigma Xi.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisors of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the Curator of Art, an annual student art exhibit is presented.

Concert Series—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board—The University Program Board, composed chiefly of elected and appointed students, is given primary responsibility and resources for student programming on campus. Through its various committees, and in cooperation with other campus groups, it regularly sponsors films, lectures, concerts, social activities, and special events.

Theater—The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

ATHLETICS, INTRAMURAL SPORTS, AND RECREATION

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball,

and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight rooms; handball and squash courts; and a sauna and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association, the Eastern College Athletic Conference, and the Eastern Association of Intercollegiate Athletics for Women. Its varsity teams compete against major universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Dean C.D. Linton
Associate Dean R.C. Rutledge
Assistant Deans R.E. Knowlton, G. Ludlow
Director of Academic Advising B.P. Selinsky

FACULTY 1982-83*

Professors E. Abravanel, J.G. Allee, Jr., J. Aschheim, D.L. Atkins, R.L.A. Bari, J.R. Barth, O. Bergmann, L.S. Bielski, L.S. Bowling, H.F. Bright, A.D. Britt, R.G. Brown, J.F. Burks, W.E. Caldwell, E.A. Caress, A.J. Caron *(Research)*, G.V. Carroll, I.H. Cisin, A.G. Coates, T.F. Courtless, Jr., R.H. Davison, L.G. DePauw, R.M. Dunn, Jr., J. Eisenstein, N. Filipescu, R.S. French, T. Freund *(Research)*, J.A. Frey, R.N. Ganz, Jr., J.L. Gastwirth, R.S. Goldfarb, M. Gordon, S.W. Greenhouse, F.S. Grubar, A. Gyorgy, S.E. Haber, M. Halperin *(Research)*, R.C. Haskett, G.R. Herer, P.H. Highfill, Jr., P.P. Hill, J.W. Hillis, A.J. Hiltebeitel, H.C. Hinton, H.H. Hobbs, M.A. Holman, C. Hsieh, R.L. Humphrey, Jr., R.G. Jones, H.D. Junghenn, I. Katz, J.W. Kendrick, R.E. Kennedy, Jr., R.W. Kenny, H. Kenyon, Y. Kim, J.C. King, A.D. Kirsch, P.F. Klarén, D. Krueger *(Research)*, R.M. Krulfeld, C.J. Lange, T.Z. Lavine, H.L. LeBlanc, D.R. Lehman, P.H.M. Lengermann, S. Levitan, B.I. Levy, J.B. Levy, J.F. Lewis, R.K. Lewis, H.W. Lilliefors, R.C. Lindholm, C.D. Linton, T.P.G. Liverman, J.M. Logsdon, W.F.E. Long, J.C. Lowe, G.E. Mazzeo, M.L. Meltzer, B.M. Mergen, J.C. Miller, C.C. Mondale, J.A. Morgan, Jr., J.N. Mosél, C.A. Moser, N.N. Natov, D. Nelson, B. Nimer, R.K. Packer, R. Parris, T.P. Perros, E.L. Phillips, F. Prats, R.E. Purcell, J.P. Reesing, Jr., B. Reich, W.M. Reynolds, C.E. Rice, J.W. Robb, L.F. Robinson, L.A. Rothblat, W.W. Rowe *(Research)*, D.A. Rowley, H.M.

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of Columbian College of Arts and Sciences.

Sachar, B.M. Sapin, R.M. Scheffler, S.O. Schiff, R.H. Schlagel, F. Schmidt *(Research)*, W.E. Schmidt, L.G. Schwoerer, R.P. Sharkey, C. Shih, F.R. Siegel, D.E. Silber, N.D. Singpurwalla, R.T. Smythe, H. Solomon, C. Steiner, G. Steiner, R.W. Stephens, C.H. Sterling, C.T. Stewart, Jr., P.L. Stewart, C. Taam, D.H. Teller, K. Thoenelt, R. Thornton, C.M. Turnbull, R.D. Walk, R.H. Walker, Jr., D.D. Wallace, Jr., R.A. Wallace, S.J. Wayne, **L. Wei, D.G. White, H.E. Yeide, Jr., A.J. Zuchelli**

Associate Professors D.A. Altshuler, J.C. Anderson, A.D. Andrews, I. Azar, L.W. Banner *(Visiting)*, S.R. Barnett, W.H. Becker, E. Berkowitz, B.L. Boulier, G.R. Bozzini, L. Brandt, M.D.M. Brewer, A.S. Brooks, A.E. Claeyssens, Jr., M.A.B. Coffland, J.J. Cordes, C.F. Elliott, E.A. Fisher, H.I. Gates, H.F. Gillette, Jr., I.I. Glick, V.K. Golla, M.D. Green, S.K. Green, W.B. Griffith, M.M. Gupta, R.A. Hadley, E.P. Harper, O. Havrylyshyn, D.R.K. Henney, C.J. Herber, D.M. Hitchcock, R.W. Holmstrom, J.O. Horton, T.L. Hufford, W.R. Johnson, S.A. Karp, N.K. Khatcheressian, M. King, I. Kyriakopoulos, D. Klingman, R.E. Knowlton, J.E. Kwoka, Jr., J.M. Lachin III *(Research)*, J.L. Lake, M.P. Lee, C.A. Linden, C.W. Linebaugh, G. Ludlow, J.H. Maddox, D. McAleavey, C. McClintock, H. Merchant, A. Montaser, H.R. Nau, G.A. Olkhovsky, T. Ozdogan, W.C. Parke, E.O. Pederson, J. Pelzman, J.A.A. Plotz, P.J. Poppen, J.A. Quitslund, D.E. Ramaker, J.R. Regnell, L.P. Ribuffo, P. Robbins, R.C. Rutledge, P.G. Sáenz, S.L. Simons, A.H. Smith, C.W. Sten, G.C. Stephens, E.A. Stone, R.H. Tanck *(Research)*, M.F. Taragin, J.M. Thibault, J.E. Thiel, R.E. Thomas, I. Thompson, N.A. Tilkens, J.L. Tropea, R.P. Trost, C.E. Tuthill, J.M. Vlach, R.C. Willson, J.F. Wright, Jr., A.M. Yezer, R.Y. Yin, J.E. Ziolkowski

Assistant Professors C.J. Allen, W.A. Anderson, M.A. Atkin, D.N. Balaam *(Visiting)*, D.A. Bositis, M.D. Bradley, W.J. Briscoe, K.M. Brown, J.R. Burns, G. Carter, M.H. Charlop, R.P. Churchill, R.L. Combs, C.C. Costigan, C.J. Deering, T. Dietz, R.P. Donaldson, M.V. Dow, P. Durgapal *(Visiting)*, H.B. Feigenbaum, V. Fon, R.S. Frey, M.W. Fu *(Visiting)*, N.C. Garner, F. Griffith, R.J. Guenther, S. Hashtroudi, J.R. Henig, J.E. Hicks, G.P. Huvé, L.B. Jacobson, D.E. Johnson, C.C. Joyner, S. Keller, M.P. Lader, J.H. Lebovic, D.L. Lee, S.R. Lichter, J.P. Link, D.L. Lipscomb, M.L. Marlow, R.D. McDevitt *(Visiting)*, M.R. Metzger, J.H. Miller, M.F. Miller, S.B. Molina, J.D. Moreno, S.L. Murray, L.R. Offermann, P.M. Palmer, G. Paster, J.R. Peverley, W.A. Pucilowsky, S.A. Quitslund, R.M. Robin *(Visiting)*, A. Romines, R. Rycroft, B.W. Sabelli, C.E. Scala, O.A. Seavey, M.S. Shapiro, S.S. Smith, M.J. Sodaro, J.L. Stephanic, P.F. Thall, M.A. Ticktin, A. Viterito, B. Von Barghahn, A.G. Wade, H.B. Wagner, G.C.Y. Wang, H.S. Watson, E.F. Wells, B.R. Williams, E.R. Williams, S.L. Wolchik, W.T. Woodward, G.E. Wright, J.A. Zilczer *(Visiting)*

Committees*

DEAN'S COUNCIL FOR FRESHMAN AND SOPHOMORE AFFAIRS

1983: J.O. Horton, J.F. Wright, Jr.

* The Dean of Columbian College is an *ex officio* member of all committees; all listed committee members are elected by the Faculty of Columbian College.

1984: M.D.M. Brewer, D.E. Silber
1985: K.M. Brown, M.M. Gupta

DEAN'S COUNCIL FOR JUNIOR AND SENIOR AFFAIRS

1983: S.R. Barnett, L.J. Wei
1984: E.P. Harper, J.R. Regnell
1985: T.F. Courtless, J.R. Henig

COMMITTEE ON ADMISSION AND ADVANCED STANDING

T.P. Perros *(Chairman)*, M.D. Green, R. Hadley, G. Ludlow, C.E. Rice, L.F. Robinson, R. Walker

COMMITTEE ON SCHOLARSHIP

R.E. Knowlton *(Chairman)*, J.A. Frey, C.J. Herber, M. King, R.M. Krulfeld, G. Ludlow, G.E. Mazzeo, J.A. Morgan, Jr., R.C. Rutledge, S.O. Schiff, B.P. Selinsky, R.A. Wallace

COMMITTEE ON STUDENT ADVISING

B.P. Selinsky *(Chairman)*, J. Aschheim, D.A. Bositis, J.R. Burns, R.L. Combs, R.S. Frey, R.E. Knowlton, G. Ludlow, J.D. Moreno, S.A. Quitslund, R.C. Rutledge, W.E. Schmidt, C. Steiner, E.A. Stone

COMMITTEE ON USE OF CORRECT ENGLISH

A.E. Claeyssens, Jr. *(Chairman)*, J.G. Allee, Jr., M. Dow, R.G. Jones, C.A. Moser, R.C. Willson

COMMITTEE ON CURRICULUM

1983: H.F. Gillette, R.W. Kenny, T.P.G. Liverman, W.E. Schmidt
1984: T.L. Hufford, J.N. Mosél, C.A. Moser, J.A. Quitslund
1985: A.E. Claeyssens, J.J. Cordes, H.H. Hobbs, J.D. Moreno

SUPERVISORY COMMITTEE ON DEGREES ADMINISTERED BY THE DIVISION OF CONTINUING EDUCATION AND SUMMER SESSIONS

R.C. Rutledge *(Chairman)*, D.L. Atkins, F.S. Grubar, C.J. Herber, M.A. Holman, D. Nelson, D.G. White

Council of Arts and Sciences*

Mark Sullivan, Jr. *(Chairman) (University Trustee), Thomson & McKinnon Auchincloss Inc.*
Windsor P. Booth, *Chief of the News Service, National Geographic Society*
David Edward Finley, formerly *Director, National Gallery of Art*
Robert R. Garvey, Jr., *Executive Secretary, Advisory Council on Historic Preservation*
Patrick Hayes, *Managing Director, Washington Performing Arts Society*
Jean Ross Howard, *Office of Public Affairs, Aerospace Industries*
John Palmer Reesing, Jr., *Professor of English*

* This Council serves both Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences. The President of the University, the Vice President for Academic Affairs, the Dean of Columbian College of Arts and Sciences, and the Dean of the Graduate School of Arts and Sciences are ex *officio* members of the Council.

Sidney Dillon Ripley II *(University Trustee), Secretary, Smithsonian Institution*
Robert Poindexter Sharkey, *Professor of Economic History*
Julian H. Singman, *Attorney*
Louis B. Wright, formerly *Director, Folger Shakespeare Library*

INTRODUCTION

Since its founding in 1821, Columbian College of Arts and Sciences, the liberal arts college of the University, has continued to expand and develop with the city of Washington. Its central situation makes participation in the life of the nation's capital convenient for resident students. The cosmopolitan nature of the student body reflects the atmosphere of a great world capital. Because the students come from the 50 states and from 120 foreign countries, class discussions and casual student conversations are enriched by a challenging variety of viewpoints.

The Columbian College program is a contemporary application of the historic liberal arts tradition. Its purpose is to enable the student to develop both particular abilities and general awareness as a human being. It demands of the student a thorough acquaintance with one major area of learning and at the same time an understanding of how that specialization fits into the larger context of the scientific, social, and moral problems which confront modern society. It stresses a broadly enlightened perspective which encourages its graduates to grow through the years in ability and wisdom.

Throughout its history, the College has kept pace with, and often led, movements of reform in higher education. Sensitive to the rapidly changing patterns of student and social needs, notably the increasing maturity and knowledge of the modern incoming freshman, the College has from time to time inaugurated major changes in its academic programs. In brief summary, present patterns are designed to (1) permit the able student to earn the baccalaureate degree in less than the standard four years, either by earning credit through a wide variety of examinations or by performing with excellence within a 90-semester-hour three-year program; (2) provide each student with a greater opportunity to design an individual academic program by eliminating almost all specific course requirements except in the major field; (3) encourage an early and close association between the student and individual faculty members in the field of the student's chief interest; and (4) foster a spirit of community and shared responsibility between faculty and student.

Opportunities exist for double majors (and minors) within the College; interdisciplinary programs; and, in the case of the student who finds no existing major or program suitable to individual educational goals, special interdisciplinary programs which may be developed by the student, in consultation with departmental advisors and with the final approval of the Committee on Curriculum.

Columbian College offers programs leading to the degrees of Associate in Arts, Bachelor of Arts, Bachelor of Science, and Bachelor of Music; pre-legal and pre-medical programs; and the first two years of the professional programs in public and international affairs.

Columbian College has degree-granting authority over certain programs which combine on-campus and off-campus courses. These include the Bachelor of Science degrees in Geodesy and Cartographic Science. As most of the courses in the first two years of these programs are offered on campus, students may be admitted as full-time on-campus students in Columbian College. After the first 64 hours, most of the courses are offered at off-campus locations. Students are then required to register for their course work with the Division of Continuing Education and Summer Sessions, which administers off-campus programs. Students attending off-campus classes are expected to provide their own transportation to and from class. Distances involved vary from two to 20 miles from the campus area. Columbian College also has degree-granting authority over two other programs which are usually offered off campus and administered by the Division of Continuing Education and Summer Sessions: Associate in Arts in General Studies and Bachelor of General Studies (areas of concentration in economics, history, mathematics, political science, psychology, and sociology). For further information on all these programs, consult the Division of Continuing Education and Summer Sessions.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college preparatory mathematics beyond introductory algebra.
2. The principal's statement that the applicant is prepared to undertake college work.
3. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test.
4. Admission to the Bachelor of Music curriculum requires, in addition to the above, a performance audition (a tape is acceptable) and/or music testing.

It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, Princeton, N.J. 08540; or 1947 Center Street, Berkeley, Calif. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

is recommended that the applicant take the tests in October of the senior year.

The Committee on Admission and Advanced Standing will consider the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all of the formal requirements stated here. The Committee may prescribe appropriate scholastic-aptitude tests of the University. Students admitted with deficiencies in secondary school units will be required to begin removing such deficiencies within the first year, by appropriate courses or examinations. Courses taken to clear entrance deficiencies will not fulfill Columbian College meaningful initiation requirements as set forth on pages 74-75, or distribution requirements prescribed by the School of Public and International Affairs.

REGULATIONS

Regulations regarding admission, registration, fees and finances are stated on pages 20-33; other University regulations, on pages 46-53.

SCHOLARSHIP REQUIREMENTS

ACADEMIC WORK LOAD

To encourage academic performance of high quality, the College limits the student's work load.

A full-time student not on probation may take a course load of as much as 17 semester hours. A student employed more than 20 hours a week who is not on probation may take not more than 10 hours.

The amount of work taken by a student on probation may be limited by the Committee on Scholarship.

A full-time student who, during the immediately preceding semester, has received no grades below *B* and has earned grades of *A* in three courses totaling at least nine semester hours may take 18 or 19 hours. An employed student who, during the immediately preceding semester, has received no grades below *B* and has earned grades of *A* in two courses totaling at least six semester hours may take 12 hours.

A student who accepts employment after registration or at any time during a semester must report that fact immediately to the dean so that the academic program may be adjusted, if necessary.

ATTENDANCE

The student is held responsible for all the work of the course in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up work missed.

ADDING AND DROPPING COURSES

After registering, a student may add or drop courses only by means of an official "drop-add" form available in the Office of Columbian College. Failure to submit the form when dropping a course may result in a failing grade. The deadline for adding a course during the regular fall or spring semesters is the end of the second week of classes.

The deadline for dropping a course without academic penalty is the end of the fourth week of classes in the fall and spring semesters. The dead-

line for complete withdrawal from all courses without academic penalty is the end of the ninth week of classes. After the deadlines, program changes require that the student present a petition to the Dean's Council.

USE OF CORRECT ENGLISH

The use of correct English, oral and written, is required in all courses. Any student whose English in any course whatever is deemed unsatisfactory may be reported by the instructor to the dean and to the Committee on the Use of Correct English. The chairman of the Committee may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed by failure to make up any such deficiency in English to the satisfaction of the Committee and the dean.

DEAN'S LIST

The name of any student who takes 15 semester hours or more of graded course work in any one semester, who receives grades of *A* in at least 60 per cent of courses taken in that semester, and who has no grades below *B*, will be placed on the Dean's List for that semester. A course taken on a Pass/No Pass basis beyond the 15-hour minimum of other courses does not affect the student's eligibility for the Dean's List, nor are the semester hours of such a course computed in the above figures. A grade of No Pass, however, disqualifies the student from the Dean's List.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The following rules governing probation and suspension are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester. Students enrolled for less than 12 semester hours during the fall or spring semester and students enrolled during the summer sessions are subject to probation or suspension on the basis of their record for four courses (three or more semester hours of credit each), or multiples thereof, rather than on their record in any one semester.

Probation—A student who in one semester receives two failing grades (*F* or Z) in courses carrying three or more semester hours of credit each, or the equivalent, is placed on probation. A student in the first semester on probation who receives one failing grade in such a course will be continued on probation for a second semester. Two grades of *D* will be treated as equivalent to one grade of *F* in determining probation. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed. A student on probation taking 12 or more semester hours whose grades are all *C* or better is removed from probation.

Suspension—The following cases constitute grounds for suspension: (1) three failing grades (*F* or Z) in courses carrying three or more semester hours of credit, or the equivalent, in one semester; (2) two failing grades in such courses in the first semester on probation; (3) one failing grade in such courses in any later semester on probation. Two grades of *D* will be

treated as equivalent to one grade of *F* in determining suspension. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed.

The minimum period of academic suspension is one fall or one spring semester. Final dates for applying for readmission are the same as those governing undergraduate admission (see page 20). A suspended student seeking readmission must submit evidence to the Committee on Admission and Advanced Standing of conduct during absence from the University which indicates that the student will profit from readmission. A student suspended twice for poor scholarship will not be readmitted.

Mid-semester Warning—When, at the end of the eighth week of each semester, instructors file in the Office of the Dean the names of freshman and sophomore students who are doing unsatisfactory work, a notice of warning is sent to the student and a copy filed with the appropriate advisor. A warning constitutes notice to the student to consult the instructor and advisor at the earliest opportunity.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 47.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

CORRESPONDENCE AND HOME-STUDY COURSES

No credit is given for work done by correspondence or in home-study courses.

CLASSIFICATION OF STUDENTS

A student becomes a *sophomore* upon completion of 30 semester hours, a *junior* upon completion of 60 semester hours, and a *senior* upon completion of 90 semester hours.

An *unclassified* student is one who is not a candidate for a bachelor's degree (normally because the student already holds one), but who wishes for valid academic reason to take a limited program for a limited time. Registration in this status is permitted only with the prior approval of the appropriate Dean's Council.

STUDY ABROAD PROGRAMS IN FRANCE AND PERU

Students in good academic standing, who will be sophomores or juniors at their proposed time of study abroad, may be eligible to participate in the George Washington University–American College in Paris Study in Paris Program, either for an academic year or for a spring semester. Qualified

students will be encouraged to take this opportunity to profit from the cultural and intellectual riches of Europe by spending a period of time living and studying in Paris. A knowledge of French is desirable but not mandatory, as all courses, except foreign languages and literatures, are taught in English.

The George Washington University in Peru Program is a student exchange program between GWU and the Universidad Católica del Perú in Lima. It is designed to permit students of the two participating universities to study a variety of subjects for a semester or academic year in the exchange university, while remaining enrolled for a degree at their home institution. The Program is primarily, but not exclusively, intended for students specializing in Latin American studies. The Program is open to all GWU sophomores and juniors and graduate SPIA students in good standing. Participating students should have a minimum grade point average of 3.00 and have a high proficiency in Spanish, since they are enrolled in regular university classes with Peruvian students.

Credits earned with acceptable grades will be transferable toward the appropriate degree at George Washington University, provided there is no duplication of work previously done. All programs of study abroad must be approved on the required forms by the appropriate faculty and administrative personnel before departure. More information on the programs in France and Peru, and on other study-abroad programs, may be secured from Assistant Dean Ludlow at the Office of Columbian College.

INACTIVE STATUS

Students in Columbian College who wish to interrupt their studies may apply to the dean for Inactive Status. They may apply at any time before the close of the registration period of the first semester for which this status is desired. If approved, Inactive Status (for which no fee is charged) assures the student for a period of one calendar year that re-entrance to the College may take place under regulations prevailing at the time of last registration. After the expiration of one calendar year of Inactive Status, or if the student has attended any other college or university during absence from this University (but see below), the student must follow regular readmission procedures and resume studies, if readmitted, under regulations then current.

Students who wish to attend another college or university, in this country or abroad, during the period of Inactive Status may, by prior petition to the dean, request approval of the planned program and, if approval is given, be assured of re-entry within one year under regulations prevailing at the time of last registration here.

LEAVE OF ABSENCE—See page 50.

ADVISORY SYSTEM

Each student is provided with both academic advising and personal counseling. *Academic* advising is performed by members of the faculty selected for their knowledge of academic programs, and each student, before registration, makes up a program in consultation with the advisor assigned. A student who has not selected a major field receives academic advising

from a member of the Columbian College Committee on Student Advising (see page 66). A student who has officially declared a major field receives academic advising from the appropriate department, or from an interdepartmental committee. *Personal* counseling is available through the Office of the Dean of Students or through the University Counseling Center. All students are encouraged to maintain close contact with their advisors. Advisors' office hours are posted in the College office.

Students who intend to transfer after the sophomore year to the School of Public and International Affairs are assigned special advisors to assist them in planning their programs.

An academic warning system permits early attention to students whose work falls below required standards. In such cases, students are asked to consult regularly with their advisors. On request, and with the student's permission, copies of academic warnings or probation notices may be sent to parents or guardians, who are themselves welcome to meet with members of the advisory staff.

ACADEMIC ADVISING CENTERS

Each department has set up Academic Advising Centers where both general educational counseling and specific major-field advising are available to students. The locations and hours of these Centers may be obtained from departmental offices.

As the freshman student deliberates choice of a major, he or she should consult with faculty advisors in as many of these Centers as he or she wishes. Once a major is officially declared, the student then receives all academic counseling from the Academic Advising Center of the major department.

PEER ADVISING

To supplement academic advising by faculty members in Columbian College, peer advising is also available during fall and spring registration and the Summer Advance Registration Program. Undergraduate peer advisors, representing a broad range of major fields, are centrally located to offer scheduling help and course selection advice to fellow students. Peer advisors are available to provide assistance throughout the academic year. A roster of current advisors is published following each registration period.

DECLARATION OF MAJOR

The student is encouraged to select and officially declare a major field early, normally no later than the end of the freshman year. All students, however, whether they are entering freshmen or transfer students, must secure the advisor's signature on a proper form (obtainable in the Office of Columbian College), and return the form to the Office of Columbian College in order to declare a major. No student is considered to have a major until this process is completed. Thereafter, the student receives academic guidance from a faculty advisor in the major-field department.

In most cases, filing of the approved declaration form assures the student of admission to the major declared; however, if space, equipment,

or other requirements compel a department or major program to limit the number of students in that major, admission to the major may be on a selective or space-available basis.

COLUMBIAN COLLEGE GENERAL COURSE REQUIREMENTS

All candidates for the degree of Bachelor of Arts or Bachelor of Science are admitted to a general arts and sciences curriculum until they declare a major field. Except for two general course requirements, all curriculum requirements leading to the degrees of Bachelor of Arts and Bachelor of Science are established by the various major field departments or programs. Bachelor of Music candidates are admitted directly into the departmental curriculum.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in English Composition, either by examination or by taking Engl 9 or 10. The first semester of English Composition may not be postponed. The second semester (Engl 11, 12, or 13) must be taken no later than the second semester of the sophomore year.

2. Each student at some point in the college career must undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As each major field will normally represent one of these three areas, the requirement may be fulfilled by taking no less than 12 semester hours in each of the other two areas. The requirement for each division must be fulfilled within two departments, or in specially designed interdisciplinary courses. (Candidates for the Bachelor of Music degree are subject to the requirements stated under Music under Courses of Instruction.) The 12 credits may be in approved introductory courses or in approved advanced courses if the student is qualified and receives the instructor's permission. Courses taken to clear entrance deficiencies do not satisfy meaningful initiation requirements. Applied and tool courses do not satisfy the requirement for meaningful initiation into the humanities. All science courses taken in fulfillment of the meaningful initiation requirement must include laboratory instruction. Waived courses (no credit assigned) cannot satisfy the meaningful initiation requirements.

It is recommended that courses taken to satisfy the meaningful initiation requirement be selected from the following:

Humanities

Art 31-32, 71-72; Classics 71, 72, 100, 108, 113; Chinese 163-64; English 51-52, 61-62, 71-72, 191-92; French 51-52, 60, 91-92; German 51-52, 103-4, 161-62; Music 3-4; Philosophy 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; Religion 9-10, 59-60, 21-22, or 23 and 9; Slavic 71, 91-92; Spanish 51-52, 91-92; Speech and Drama 45, 49, 133, 143, 144, 165, 166, 173, 192.

Natural and Mathematical Sciences

Biology 3-4, 11-12; Chemistry 3-4, 11-12; Geology 1-2, 5 and 2, or 5 and 105; Mathematics 31-32, 32-33, 41-42, 51-52, 53-54, 9-10, or any combination of two upper-level math courses; Physics 1-2, 9-10; Statistics 51 and 107 or 105, 53 and 107 or 105, 91 and 107, or 111-12.

Social Sciences

American Civilization 71-72; Anthropology 1-2; Economics 1-2; Geography 1-2; History 71-72, 39-40, 72 and 91, 40 and 91, one introductory course and a related 100-level course approved by the History Department, or (for those students who have waived introductory courses) two sequential 100-level courses approved by the History Department chairman or advisor; Journalism 71-72, 111 and 115; Political Science 1-2; Psychology 1 and another psychology course; Sociology 1-2 or Sociology 1 and any 100-level sociology course.

The following courses will not satisfy the meaningful initiation requirement: Applied courses in art (also Art 1); applied courses in music and in speech and drama (SpDr 1 and 11); English composition courses; basic (first- and second-year) foreign language courses; Math 3, 6, 30.

Required Placement Examinations

English—Students whose scores on either the Test of Standard Written English or on the English Composition Achievement Test suggest that they will benefit from more intensive training in compositional skills may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10. Students whose scores indicate superior competence will be allowed to waive the Engl 10 requirement.

English for International Students—see pages 25-26.

Foreign Languages—A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion of the examination, assignment is made to the appropriate course.

Mathematics—New students who wish to register in Math 30, 31, or 41 are required, prior to registration, to take a placement examination in algebra and trigonometry; those wishing to register in Math 51 are required, prior to registration, to take a placement examination in algebra.

Foreign Language Requirement

In most major programs requiring foreign languages a student must complete satisfactorily the equivalent of two years of college work in a single foreign language.

A student offering for admission four acceptable high school units of a single foreign language, or the equivalent, is not required to take any foreign language.

A student who offers less than four units and wishes to continue the same language must take the language placement test.

In many instances foreign languages are required or recommended as preparation for advanced work. The student should consult the advisor so that appropriate foreign languages may be included, when necessary, in the student's program.

First- and Second-Group Courses

First-group courses, those numbered from 1 to 100, are intended primarily

for freshmen and sophomores. Second-group courses, those numbered from 101 to 200, are intended for juniors and seniors. However, a qualified freshman or sophomore may, with the permission of the advisor and of the department concerned, take second-group courses. Such qualification is achieved by passing or waiving introductory courses or prerequisite courses in the first group.

Courses in the Major Field or Department

Every student is given the opportunity of taking a wide range of liberal arts subjects—humanities, natural and mathematical sciences, social sciences—both as a means of laying the groundwork for more concentrated major-field study and as a means of determining what academic area is best adapted to the student's interests and aptitudes. In order to enhance this opportunity and to avoid over-specialization once a major has been selected, the student must take at least 60 hours of course work, including the general course requirements of Columbian College, outside the major-field department or major program. (This does not apply to students in the 90-hour degree program or the Bachelor of Music program.)

Professional Courses

Except for majors in applied mathematics and for students interested in teacher certification or intending to apply for the combined degree of Bachelor of Arts and Doctor of Medicine, no more than 12 hours of professional courses, e.g., courses offered in units of the University other than Columbian College, may be included in the hours required for the bachelor's degrees in Columbian College. Students electing professional courses under this rule must obtain the approval of the dean before registration.

Human Kinetics and Leisure Studies

Courses in Human Kinetics and Leisure Studies are not required, nor are such courses generally acceptable for credit toward a degree. Upon prior petition to the dean, however, certain courses in dance as an art form may be included in the 12 hours of professional credit permitted.

Service-Learning Program

A maximum of 15 semester hours in Service-Learning Program courses may be credited toward bachelor's degrees in Columbian College.

Earning Credit By Examination

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned for any combination of the following:

College Entrance Examination Board Advanced Placement Tests—Credit may be granted for college-level courses taken in an approved secondary school if substantiated by satisfactory performance on the Advanced Placement Tests. See page 24 for further details.

College Entrance Examination Board College-Level Examination Program (CLEP)—Prior to matriculation, credit may be assigned for CLEP General Examinations passed at the 50th percentile or above. Credit may be assigned for any CLEP Subject Examinations passed at the level recommended in the College Board model policy. A few examinations in both categories, however, are unacceptable for credit. See pages 22-23 for specific exceptions.

After matriculation, credit for CLEP Subject Examinations will not be assigned without special authorization by the Columbian College department governing the subject involved. See pages 22-23 for additional information.

Special Departmental Examinations—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If an appropriate CLEP Subject Examination is available, the department may choose to employ it.) Approval of such a request is not automatically granted; the student must offer evidence of sufficient background to have a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examinations will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparation, administration, and grading of the examination.

Waiving Introductory Courses by Examination

Placement Tests—Many departments in Columbian College, including English, mathematics and all foreign languages, require students to take placement tests to determine level of proficiency or eligibility for specified courses. The student is placed in an appropriate course on the basis of these tests. There is no charge to the student for placement tests, and no credit (advanced standing) is awarded for courses bypassed or waived as a result of these tests.

Waiver Examinations—Several departments in Columbian College, including English, history and sociology, offer periodic waiver examinations for introductory courses. Such examinations may be attempted at the option of the student; a fee of $5 is charged. Specific departments should be consulted for further details. *Passing a waiver examination does not entitle a student to any semester hours of credit.*

Earning Additional Semester Hour of Credit

Normally, no deviation is permitted from the number of semester hours of credit given in parentheses after the title of each course. In exceptional circumstances, however, and with the prior approval in writing of the instructor and the dean, a student may register for and earn an additional semester hour of credit in certain appropriate second-group (upper-division) courses by doing a significant amount of extra work as assigned and supervised by the instructor. This privilege is not applicable during the Summer Sessions.

PREPROFESSIONAL REQUIREMENTS

Students who plan to major in any program offered by the School of Public and International Affairs are registered during the freshman and sophomore years in Columbian College. Requirements for the first two years of these programs, as well as requirements for the premedical program, are listed on the following pages.

Premedical Curriculum

A premedical student who intends to work toward a bachelor's degree fulfills the general requirements of Columbian College stated above, and may follow the major field curricula of any Columbian College department. Each premedical program must be approved by the premedical advisor. For admission to most medical schools the student must have a minimum of 90 semester hours applicable toward a degree in an approved college of arts and sciences; the 90 hours must include

1. *Biology:* eight semester hours. This may be either in general biology or zoology but may *not* include separately credited courses in botany.
2. *Chemistry:* eight semester hours of general inorganic chemistry (which may include qualitative analysis), including four semester hours of laboratory; and six to eight semester hours of organic chemistry, including laboratory.
3. *Physics:* eight semester hours, including at least two semester hours of laboratory.
4. *English:* six semester hours. This may be the usual introductory college course or its equivalent.

Many medical schools have additional entrance requirements, among which are courses in biochemistry, embryology, histology, genetics, and mathematics. Even where such courses are not actually required, they are strongly recommended.

With the exception of these specific requirements applicants are urged to follow their personal interests in developing their premedical courses of study. A well-balanced program, rather than a specific field, is the criterion by which an applicant is judged. It is not advisable to take courses that appear to cover subject matter in the medical program.

While well-qualified candidates are eligible for admission after completing the minimum 90 semester-hour requirement, the majority of applicants are found to be better prepared for the study of medicine after four years of college work.

Preparation for Law School

The best undergraduate preparation for law school is a solid, broad, liberal education. Columbian College, therefore, does not prescribe a "pre-legal" curriculum. The Associate Dean of the College, however, is designated as Pre-Law Advisor, and students interested in legal studies should consult him for information and guidance.

Chinese Language and Literature

The first two years in preparation for the Bachelor of Arts degree with a major in Chinese Language and Literature in the School of Public and

International Affairs consists of a minimum of 60 semester hours. Each student must, during the freshman year, demonstrate adequate achievement in English Composition, either by examination or by taking Engl 9 or 10, and Engl 11 or 12. The student must also undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As the major field represents one of these three areas, the requirement may be fulfilled by taking no less than six semester hours of approved introductory courses, or six semester hours in approved advanced courses if the student is qualified and receives the instructor's permission, in the natural and mathematical sciences and in social sciences. Students must include in their program of study Chin 1-2, 3-4, and 9; Chin 7-8 and 9; or Chin 5-6. Chin 5-6 is preferred.

East Asian Studies, Middle Eastern Studies, or International Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the field of East Asian Studies (China or Japan), Middle Eastern Studies, or International Affairs in the School of Public and International Affairs:

		Semester Hours
English:	Engl 9 or 10, and 11 or 12	6
Humanities:	Art 31–32 or 71–72; Clas 108, 113; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60	6
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish	12–16
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; Stat 51, 53, or 91, and 105 or 107; 107, 108; 111, 112	6–8
Social Science:	Econ 1–2; Hist 40 and 72; PSc 1, 2, and 91§	21
‡Elective:		3–9
	Total	60

Public Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the field of Public Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities:	Art 31–32 or 71–72; Clas 108, 113; *Literature (Ameri-	

* If a student elects six semester hours of literature in any foreign language, this cannot be used to satisfy the language requirement.
† Chin 5-6 is required for East Asian Studies (China focus) majors; Japn 3-4 is required for East Asian Studies (Japan focus) majors. Greek and Latin are not acceptable for International Affairs or Public Affairs majors. Middle Eastern Studies majors may substitute other languages with the approval of the program advisor.
‡ Credit is not given for courses elected in the Department of Human Kinetics and Leisure Studies.
§ PSc 91 is not required for the Middle Eastern Studies program.

		Semester Hours
	can, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second group Philosophy courses; Rel 21, 59–60	6
Language or Statistics:	..... NOTE: This requirement may be satisfied by two years of one foreign language† or 12 semester hours of statistics. Statistics courses taken to fulfill this requirement may not also satisfy the math/science requirement below.	12
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; Stat 51, 53, or 91, and 105 or 107; 107, 108; 111, 112	6–8
Social Science:	Econ 1–2; Hist 40 and 71–72; PSc 1 and 2	21
*Elective:	.....	7–9
	Total	60

Urban Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the field of Urban Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities:	Art 31–32 or 71–72; Clas 108, 113, Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60	6
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10	6–8
Social Science:	Econ 1–2, Hist 71–72, and PSc 2.....	15
	Three semester hours selected from either AmCv/ Hist/PSc 50 or Soc 2	3
*Elective:	Students may substitute some of the required courses for the major for elective courses during the sophomore year	22–24
	Total	60

DEGREE PROGRAMS

ASSOCIATE IN ARTS DEGREE

The Associate in Arts Degree may be granted to a student who has completed 60 semester hours in arts and sciences with acceptable grades, and who has fulfilled the general requirements described on page 74. In addition, the degree may be awarded to pre-public and international affairs students upon completion of the curriculum specified for the first two years of the appropriate program. The last 15 semester hours of the program of study must be completed in residence in Columbian College.

* Credit is not given for courses elected in the Department of Human Kinetics and Leisure Studies.

A student wishing to receive this degree must file an Application for Graduation at the time of registration for the semester or summer session in which the requirements will be completed.

THE BACHELOR'S DEGREES

Columbian College offers programs leading to the degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Music.

In cooperation with the School of Medicine and Health Sciences a seven-year curriculum leading to the combined degrees of Bachelor of Arts and Doctor of Medicine is offered.

For teacher certification for Columbian College students, see page 106.

Requirements for the Degrees

SCHOLARSHIP

One hundred and twenty hours of course work must be passed and a grade level (not to be confused with the quality-point index as computed by the Registrar and shown on the transcript) of 2.00 achieved in courses graded on a four-point scale. At least 60 hours of course work, including the general course requirements of Columbian College, must be taken outside the major-field department or major program. (This does not apply to the 129-hour Bachelor of Music curriculum.)

The grade level is obtained by dividing the number of quality points by the number of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. Both the number of quality points and the number of semester hours of courses are based on the student's record at this University. The grade level is computed on a four-point scale—*A*, four points; *B*, three points; *C*, two points; *D*, one point—for each semester hour which the student has taken. Courses marked *F*, *Z*, *W*, *I*, *IP*, *P*, or *NP* are not considered in determining the grade level, though courses passed with *P* count toward the 120-hour overall requirement. (When a formal grade is recorded for an Incomplete, a grade of *D* or better will be included in the computation of the grade level.) A grade of Incomplete which is not removed within one semester is automatically changed to an *F*. Grades earned in courses taken at another institution are not considered in computing the grade level. At the time of graduation, a student must be in good academic standing. See pages 85-86 for scholarship requirements applicable specifically to departmental majors.

RESIDENCE

For the standard 120-semester-hour program—A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed in residence in Columbian College. *Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior year must be completed in residence.* This requirement applies to students transferring within the University as well as to students transferring from other institutions.

For the 90-semester-hour program—The last 60 semester hours, including

at least 12 hours in the major field, must be completed in residence in Columbian College.

Summer work may be counted in residence toward all Columbian College degrees. For regulations governing students who are absent from the University for one semester or more, see Leave of Absence and Inactive Status, pages 50 and 72.

CURRICULUM REQUIREMENTS

A change in degree candidacy within Columbian College (e.g., from Bachelor of Arts to Bachelor of Science) requires the permission of the dean. The degree requirements effective at the time the change is approved must be met.

First-group courses may be required as prerequisites to the major, but because of their introductory character they cannot be counted as part of such programs. (See Explanation of Course Numbers stated under Courses of Instruction.)

PASS/NO PASS OPTION

A junior or senior student in Columbian College who is in good standing may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *P*, Pass, or *NP*, No Pass. No student will be allowed to take more than four pass/no pass courses under this regulation. The student may, however, also receive grades of *P/NP* in the proseminar for field-of-study majors and in other courses normally using such grades. A student must sign up for the pass/no pass option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Courses required in the student's major field (courses required in the major department or those required outside the major department) may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment in this University.

TUTORIAL STUDY

A junior or senior of demonstrated capacity, with a special interest in the subject matter of a regularly listed course, may be permitted to take tutorial study in residence under the personal direction of the instructor, in accordance with the rules of the appropriate department and with the approval of the dean. Credit under this plan is limited to the specific semester hours of credit designated for each course in the list of courses of instruction. It assumes frequent and regular conferences between the student and instructor.

THE STANDARD 120-SEMESTER-HOUR PROGRAM

One hundred and twenty semester hours of course work are required for graduation. At least 60 hours of course work must be taken outside the major department or program. The student should consult the advisor at each registration about choice of courses.

Each student should declare a major as soon as possible, preferably upon completion of 30 semester hours. A student may change the major with the consent of the dean and of the department or committee concerned;

the student must meet the requirements for the new major in effect at the time the change is approved.

Students transferring from other institutions or from other schools, colleges, or divisions in this University, with major requirements wholly or substantially met, must satisfy the residence requirement of Columbian College stated above.

THE 90-SEMESTER-HOUR PROGRAM

The 90-semester-hour degree program is designed for the exceptionally able student. This program, which leads to the regular Columbian College degrees, makes it possible to graduate in three normal academic years with a total of 90 semester hours of credit instead of the standard 120. Students in this program must complete all of the requirements for the three-year degree in the semester in which the 90th semester hour is achieved.

The requirements for this program are (1) 90 semester hours of credit earned in college courses (that is, the 90-hour requirement may not be reduced by credit earned through examinations); (2) completion of the chosen major-field program and general curricular requirements; (3) grades of *A* in at least 45 semester hours of course work and *no* grades below *C*; (4) at least 60 semester hours of credit earned in 100-level courses; and (5) recommendation of the major department or program.

To be eligible for this program, the student must show evidence of exceptional academic ability by college record, performance in college courses, and other appropriate information.

An interested student should make application directly to the major-field departmental chairman or program director as soon as possible, preferably by the end of the first year of study. The student's academic record to that point will, of course, provide a useful criterion of eligibility.

A transfer student may qualify for graduation under the 90-hour program provided the student completes at least 60 semester hours of the approved 90-hour program in Columbian College, earns grades of *A* in no less than 45 semester hours of such course work at this University, and has no grades below *C*.

A student who fails to maintain the required academic performance while studying toward the 90-hour degree program simply continues for the standard 120-hour degree.

Bachelor of Arts

The Bachelor of Arts degree is offered in the following fields:

American Civilization
American Literature
Anthropology
Applied Mathematics
Art History
Biology
Botany
Chemistry
Chinese Language and Literature
Classical Archaeology and Anthropology
Classical Archaeology and Classics
Classical Humanities
Computer and Information Systems
Criminal Justice
Dramatic Art
Early Modern European Studies
Economics
English Literature
Environmental Studies

Fine Arts
French Language and Literature
General Curriculum in the Liberal Arts
Geography
Geology
Germanic Languages and Literatures
History
Journalism
Judaic Studies
Latin American Studies
Mathematics
Music
Philosophy
Physics
Political Communications
Political Science
Psychology
Radio-Television
Religion
Russian Language and Literature
Russian Literature and Culture—in Translation
Sociology
Spanish-American Literature
Spanish Language and Literature
Speech Communication
Speech Pathology and Audiology
Statistics (Computer Science option)
Zoology

Combined Degrees of Bachelor of Arts and Doctor of Medicine

A candidate for the combined degrees of Bachelor of Arts and Doctor of Medicine must (1) complete the entrance requirements for the Doctor of Medicine degree in the School of Medicine and Health Sciences; (2) complete the general Columbian College course requirements; (3) accumulate 90 semester hours in the liberal arts, including a minimum of 30 in second-group courses in Columbian College; (4) obtain the approval of the Dean of Columbian College at the time of entering the School of Medicine and Health Sciences; (5) obtain the recommendation of the Dean for Academic Affairs of the Medical Center at the completion of all prescribed courses in the first year of the School of Medicine and Health Sciences, at which time the degree of Bachelor of Arts will be conferred (professional work taken at another institution will not satisfy the major requirement of the combined degrees); (6) maintain throughout the entire course the scholarship level required for graduation.

Bachelor of Science

The Bachelor of Science degree is offered in the following fields:

Applied Mathematics
Biology
Botany
Chemistry
Computer and Information Systems
Environmental Studies
Geology
Geology (Engineering option)
Mathematics
Physics
Statistics (Computer Science option)
Zoology

The Undergraduate Major

There are two types of undergraduate majors: the Field-of-Study major and the Departmental major. Six majors—Classical Archaeology and Anthropology, Classical Archaeology and Classics, Environmental Studies, Judaic Studies, Latin American Studies, and Political Communications—although interdepartmental in nature, are governed by the regulations of the Departmental major.

Refer to the department concerned under Courses of Instruction to determine whether a major is Departmental or Field-of-Study.

FIELD-OF-STUDY MAJOR

Each Field-of-Study major covers a carefully worked out field of coordinated study and is under the supervision of the appropriate department and the Columbian College Committee on Curriculum.

The Field-of-Study major requires no specific program of courses, although the student is required to meet the over-all general requirements for the degree. Ability to pass the Major Examination is assumed to be a convincing demonstration that the student possesses the breadth, depth, and quality of knowledge of the major usually defined in terms of semester hours, courses, and grades. Information on each field is obtainable from the department. Immediately upon declaring a major, students should consult the appropriate department so that they may be assigned an advisor.

The Field-of-Study major places special emphasis on the intellectual development of the individual student. Programs in the same major may vary, depending upon the individual student's background, previous study, and aptitudes. The student is expected to consult the advisor frequently, and the special proseminars offered in some fields give the student further opportunity for individual advice and direction in pursuing a program especially adapted to individual needs and abilities. A close student-advisor relationship is essential for the student's success under the Field-of-Study major plan.

Proseminar in the Major—A proseminar is offered in most fields to help the student acquire a coordinated knowledge of the chosen field through reading, study, and laboratory exercises. It is a presentation of the content and methods of the major field as a whole through the organization and coordination of the knowledge obtained in the various formal courses in the major subject and of material not usually included in such courses. This course is not required, but, if it is elected, strict attendance is essential. Six semester hours, but no qualitative grade, may be assigned. When registered in this course, the student has the privilege of visiting, subject to the approval of the instructor, any other appropriate course offered in the College. (Regular attendance in a course, either for credit or as an auditor, requires registration and payment of tuition.) Proseminars are open only to the student who has been accepted as a candidate under that specific major.

The Major Examination—The Major Examination will normally be taken at the close of the senior year; a student on a limited schedule may take it no earlier than one calendar year before graduation. A student who fails to pass a Major Examination may, at the discretion of the Committee on Curriculum, be re-examined at a later regular major-examination period. The Committee on Curriculum has general supervision of the preparation, reading, and grading of Major Examinations. Major Examinations are held each semester on dates fixed by the department or departments concerned, but in no case later than December 1 for the fall semester, April 13 for the spring semester, and August 26 for the summer sessions.

DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in terms of

credit hours, required courses, and the attainment of grades no lower than *C* in the minimum required second-group courses taken in the major field. A *D* in a required course will satisfy a curricular requirement in the major, but it will not count toward the minimum number of hours required in the major. (A department may require a degree candidate to repeat a required course in which a *D* was received; credit for only one of these courses will be given.) The minimum specific requirements for Departmental majors are listed below the staff of instruction of the department concerned. The chairman of the department, or designated departmental advisor, should be consulted at registration concerning the student's program of courses; and the entire program, including electives, must be approved by the department. The student is also expected to consult the chairman or advisor in all matters affecting the program of studies, such as changes, substitutions, or withdrawals, and especially concerning the student's progress in a course. A close student-advisor relationship is desirable.

MINORS

Students who wish to familiarize themselves with a field outside their major may graduate with a minor in addition to the major. Not all Columbian College departments offer undergraduate minors; the requirements prescribed by those that do are listed under the department involved. A student interested in a minor should consult faculty advisors in the department concerned and declare both major and minor programs on the appropriate form available in the dean's office.

At least one half of the course work required for a minor must be done in residence. Grades of *C* or better must be earned in second-group courses, including such courses transferred as advanced standing from another institution. Courses passed with a *D* may be used to fulfill a minor field curricular requirement, but may not be counted toward the total number of credit hours required for the minor.

DOUBLE MAJORS

With the prior approval of the departments concerned, a student who completes the requirements of two major fields in Columbian College (for example, mathematics and physics, or English and French, or history and economics) may graduate with a double major. Such a student should consult with advisors in the two departments concerned and officially declare both majors on the appropriate forms available in the dean's office. A double major must be taken in departments offering the same degree (either the B.A. or the B.S.); a major field in Columbian College cannot be combined with a major field offered by another degree-granting unit of the University.

INTERDISCIPLINARY PROGRAMS

Regular Interdisciplinary Programs—Several programs presently exist, including American Civilization, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Early Modern European Studies, Environmental Studies, Judaic Studies, Latin American Studies, and Political Communications.

Special Interdisciplinary Programs—A student who finds no existing major or program suited to individual educational goals may develop a special major program, in consultation with appropriate departmental advisors. Final approval of such a program rests with the Committee on Curriculum. Only programs with valid and clearly defined academic goals will be approved, and each shall be designated by a title suggested by the student to the Committee on Curriculum for approval. At least 45 semester hours of credit of the approved program must be completed in Columbian College. Because of their broad scope, such interdisciplinary majors may not be combined with a double major.

A student in an interdisciplinary program will be expected, during the second semester of the senior year, to take a comprehensive examination (either oral or written) in the interdisciplinary field, or to undertake a senior comprehensive thesis, at the discretion of the student's interdepartmental committee.

Special Interdisciplinary Courses—Under the supervision of the Committee on Curriculum, new courses will be offered each semester combining the methods and insights of several disciplines. Interested students should consult the current *Schedule of Classes*, where they will find such courses numbered in the 700s. A student wishing to use any of these courses to satisfy the requirement of meaningful initiation into the three divisions of knowledge (see Columbian College General Course Requirements) should consult the sponsoring department.

General Curriculum in the Liberal Arts—Directed by the Curriculum Committee of Columbian College of Arts and Sciences, this program is designed to provide a general education in the liberal arts, with or without a major, as the student chooses. It offers opportunity for achieving a substantial acquaintance with each of the three divisions of knowledge through a selection of courses that cultivate a broad perspective in time and in national and/or cultural traditions. The committee appointed to advise students in the program consists of one representative each from the humanities, the social sciences, and the natural and mathematical sciences. For curriculum requirements, see General Curriculum in the Liberal Arts under Courses of Instruction.

GRADUATE SCHOOL OF ARTS AND SCIENCES

Dean H. Solomon
Assistant Deans A.D. Andrews, E.A. Caress, D.A. Rowley, C.E. Rice

FACULTY AND CONSULTANTS 1982-83

Faculty*

Professors E. Abravanel, A.V. Adams *(Research)*, L.F. Affronti, E.N. Albert, F.D. Allan, J.G. Allee, Jr., J. Aschheim, D.L. Atkins, J.M. Bailey, R.L.A. Bari, J.R. Barth, O. Bergmann, S. Bloom, L.S. Bowling, H.F. Bright, A.D. Britt, R.G. Brown, J.F. Burks, W.E. Caldwell, E.A. Caress, G.V. Carroll, M.M. Cassidy, I.H. Cisin, A.G. Coates, V.H. Cohn, T.F. Courtless, Jr., M.F. Cunliffe, R.H. Davison, L.G. DePauw, R.M. Dunn, Jr., J. Eisenstein, A. Etzioni, S.E. Fabro *(Research)*, N. Filipescu, R.S. French, J.A. Frey, R.N. Ganz, Jr., J.L. Gastwirth, R.S. Goldfarb, A.L. Goldstein, M. Gordon, S.W. Greenhouse, F.S. Grubar, A. Gyorgy, S.E. Haber, R.C. Haskett, P.H. Highfill, Jr., P.P. Hill, J.W. Hillis, H.C. Hinton, A.J. Hiltebeitel, H.H. Hobbs, M.A. Holman, C. Hsieh, K. Huang, R. Hugh, R.L. Humphrey, Jr., M.J. Jackson, T.N. Johnson, R.G. Jones, H.D. Junghenn, I. Katz, J.W. Kendrick, R.E. Kennedy, Jr., R.A. Kenney, R.W. Kenny, H. Kenyon, Y. Kim, P.D. Kind, J.C. King, A.D. Kirsch, P.F. Klarén, M.J. Koering, R.M. Krulfeld, T.Z. Lavine, H.L. LeBlanc, D.R. Lehman, P.H.M. Lengermann, S. Levitan, B.I. Levy, J.B. Levy, J.F. Lewis, R.K. Lewis, H.W. Lilliefors, R.C. Lindholm, C.D. Linton, T.P.G. Liverman, J.M. Logsdon, W.F.E. Long, J.C. Lowe, H.G. Mandel, P. Mazel, G.E. Mazzeo, M.L. Meltzer, B.M. Mergen, J.W. Millar, F.N. Miller, J. Miller, C.C. Mondale, J.A. Morgan, Jr., J.N. Mosél, C.A. Moser, N.N. Natov, D. Nelson, B. Nimer, C. O'Rear, R.K. Packer, R. Parris, T.P. Perros, V. Petrov, E.L. Phillips, F. Prats, R.E. Purcell, J.P. Reesing, Jr., B. Reich, M. Reich, C.E. Rice, J.W. Robb, L.F. Robinson, L.A. Rothblat, D.A. Rowley, H.M. Sachar, B.M. Sapin, R.M. Scheffler, S.O. Schiff, R.H. Schlagel, W.E. Schmidt, L.G. Schwoerer, R.P. Sharkey, H. Sidransky, F.R. Siegel, G. Sigur, D.E. Silber, B.W. Smith, R.S. Snell, H. Solomon, G. Stambuk, J.E. Starrs, C. Steiner, G. Steiner, R.W. Stephens, C.T. Stewart, Jr., P.L. Stewart, J.A. Straw, C. Taam, D.H. Teller, K. Thoenelt, R. Thornton, C.S. Tidball, M.E. Tidball, C.M. Turnbull, G.V. Vahouny, R.D. Walk, R.H. Walker, Jr., D.D. Wallace, Jr., R.A. Wallace, S.J. Wayne, D.G. White, H.B. Yakobson, H.E. Yeide, Jr., J. Zeidner, A.J. Zuchelli

Associate Professors F.P. Abramson, Y. Al-Doory, R.J. Anderson, A.D. Andrews, I. Azar, S.R. Barnett, W.H. Becker, E. Berkowitz, B.L. Boulier, L. Brandt, A.S. Brooks, M.A.B. Coffland, J.J. Cordes, C.F. Elliott, A.K. Fitzsimmons, L.L. Gallo, C.T. Garrett, H.I. Gates, H.F. Gillette, Jr., I.I. Glick, V.K. Golla, M.D. Green, S.K. Green, W.B. Griffith, R.A. Hadley, O. Havrylyshyn, D.R.K. Henney, C.J. Herber, D.M. Hitchcock, R.W. Holmstrom, J.O. Horton, T.L. Hufford, K.E. Johnson, W.R. Johnson, S.A.

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the Graduate School of Arts and Sciences.

Karp, S.G. Kent, N.K. Khatcheressian, M. King, D. Klingman, P. Klubes, R.E. Knowlton, A. Kumar, J.E. Kwoka, Jr., J. Lake, N.T. Lappas, J.W. Larsen, R.A. Lavine, M.P. Lee, C.A. Linden, C.W. Linebaugh, G. Ludlow, J.H. Maddox, D. McAleavey, C. McClintock, H. Merchant, H.R. Nau, G.A. Olkhovsky, J.M. Orenstein, T. Ozdogan, W.C. Parke, E.O. Pederson, J. Pelzman, J.A.A. Plotz, P.J. Poppen, J.A. Quitslund, L.P. Ribuffo, W.F. Rowe, P.G. Sáenz, S.L. Simons, F. Slaby, A.H. Smith, C.W. Sten, G.C. Stephens, G. Stokes, E.A. Stone, M.F. Taragin, J.M. Thibault, I. Thompson, N.A. Tilkens, J.L. Tropea, R.P. Trost, C.E. Tuthill, J.M. Vlach, G.A. Walker, R.J. Walsh, D.W. Watkins, J.F. Wright, Jr., A.M. Yezer, R.Y. Yin, B.C. Zook

Assistant Professors C.J. Allen, J.C. Anderson, M.A. Atkin, B.L. Bean, D.A. Bositis, R.C. Bohn, N.A. Brown, J.R. Burns, G. Carter, M.H. Charlop, R.P. Churchill, R.L. Combs, C. Costigan, C.J. Deering, T. Dietz, R.P. Donaldson, H.B. Feigenbaum, V. Fon, R.S. Frey, N.C. Garner, F. Griffith, R.J. Guenther, E.P. Harper, S. Hashtroudi, J. Henig, D.E. Johnson, C.C. Joyner, J.K. Kelleher, M.P. Lader, S.R. Lichter, M.R. Metzger, S.B. Molina, T. Moody, J.D. Moreno, P.M. Palmer, G. Paster, K.D. Peusner, A. Romines, J.M. Rosenstein, R. Rycroft, R.S. Schulof, A.M. Schwartz, O.A. Seavey, M.S. Shapiro, S.S. Smith, M. Sodaro, J.L. Stephanic, A. Viterito, B. Von Barghahn, H.S. Watson, E.F. Wells, E.R. Williams, K.J. Williams, S.L. Wolchik, W.T. Woodward

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Consultants in Research

R.S. Adelstein, J. Adkins, O. Agbede, E.P. Anderson, W.B. Anderson, A.A. Ansari, R. Asofsky, W. Back, J.L. Barnard, J. Bellanti, L. Bilker, E.J. Blanchette-Mackie, L. Bockstahler, C. Boone, W. Bowman, M.F. Brennan, M. Brightman, B.L. Brown, S.W. Burks, C.P. Butcher, C. Carson, K.J. Catt, K. Chang, M.A. Chirigos, L.A. Cohen, J.Y. Cole, Jr., B. Collette, E. Costa, R. Cysyk, R.E. Darcy, C. Dawe, J. Farrar, C.R. Field, M.R.S. Fox, J.E. Fredland, E. Freese, R.M. Friedman, J.D. Gardner, R. Gibbs, Jr., J. Goldstein, R. Goldstein, J. Granger, G. Guroff, F. Gutheim, G. Hager, J. Hardt, R. Harmon, J.E. Hazel, R.C. Henneberry, R. Herberman, P.N. Herbert, G. Hodgen, J.M. Holmes, L. Horton, R. Houbrick, T. Hunt, D. Jacobowitz, M.L. Jones, S. Jong, C.D. Kahn, R.K. Kahn, M.J. Katzoff, C.E.B. Klee, M.W. Kranz, F.M. Kregenow, D.M. Kuhn, W. Lednar, L.P. Leite, L.S. Lessin, R. Levy, M.E. Lippman, D. Liu, D.R. Livengood, D.L. Loriaux, W.M. Lovenberg, P. Lundeberg, W. Madow, R. Mage, C.R. Manclark, R.W. Manderscheid, S.B. Marley, Jr., P.C. Marzio, S.R. Mazzur, B.F. Meeker, J.L. Middlebrook, L.B. Miller, M. Mishkin, J. Mitchell, B.R. Murphy, B.C. Myhr, D.L. Nelson, S. Oroszlan, J.C. Osborne, Jr., D.B. Parsons, A. Peacock, J. Pisano, J.W. Porter, R.M. Pratt, Jr., U.R. Rapp, A. Raskin, W.D. Rasmussen, S.A. Rosenberg, G.S. Roth, A.N. Schechter, F.L. Schmidt, L.P. Schultz, D. Segal, R.S. Sigafoos, L.B. Smith, L. Sokoloff, M.B. Sporn, T.C. Stadtman, J.R. Stephen-

son, S. Stewart, K.L. Storrs, C.W. Tabor, H. Tabor, J.F. Tallman, R. Ting, H. Viola, P. Voytek, W.C. Wallen, R.W. Wannemacher, Jr., W.E. Washburn, R.L. Weintraub, S.H. Weitzman, W.G. Whittaker, J.R. Williams, S.H. Wilson

Field of Studies Consultants

R.V. Allen, I. Breger, G. Evans, A. Fern, J. Fulton, R.P. Hallion, H.J. Hogan, A. Jabbour, B. Klein, J.B. Kuiper, V. McKay, M. Moloney, J.N. Norris IV, J.C. Osborne, Jr., N.L. Sass, S.I. Shibko, P.C. Spehr, J.W. Witherell

HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for advanced study and research leading to Master's degrees in the arts and sciences and the degree of Doctor of Philosophy. Graduate programs at George Washington University were first formally organized under the Graduate School in 1905, following several decades of gradual growth in a number of departments. In 1930 the Graduate School was discontinued. Columbian College, the University's liberal arts college, then assumed responsibility for the Master of Arts and Master of Science degrees, and a newly created Graduate Council administered all Doctor of Philosophy programs. Professional schools took responsibility for advanced degrees in the professional fields.

In 1967 the Graduate Council and the Graduate Division of Columbian College were consolidated into a new Graduate School of Arts and Sciences. All graduate programs in the arts and sciences leading to the degrees of Master of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science for Teachers, Master of Science in Forensic Science, and Doctor of Philosophy are under the Graduate School.

In addition, a Master of Philosophy degree is awarded by the School, upon recommendation of the appropriate department, to students who have successfully completed the General Examination for the Doctor of Philosophy degree.

The School is under the direction of the Graduate Faculty of Arts and Sciences. It is the responsibility of the Faculty to set the requirements for admission to the School, to provide courses and programs of study and research for its students, to establish academic standards for its degrees, to recommend to the Board of Trustees the awarding of degrees, to lay down regulations as needed for the operation of the School, and generally to supervise its activities.

The administration of the School is vested in the dean, who is chairman of the Dean's Council, which is responsible to the Faculty of the School for all policy matters.

ADMISSION REQUIREMENTS

Application forms for admission to graduate study are obtained from the Office of the Dean of the Graduate School of Arts and Sciences. When completed, these application forms must be submitted to this office, together with college transcripts and letters of reference, and other informa-

tion as required by the department or program. Admission is dependent on departmental recommendation and approval by the dean.

Applicants must have academic backgrounds of excellence, usually with majors, or equivalent, in the fields in which they intend to study for advanced degrees. Normally, a *B* average (or equivalent) from an accredited college is required. With evidence of special promise, such as high Graduate Record Examination scores, an applicant may be accepted whose academic record falls short of *B*. The minimum does not assure automatic acceptance. The departments may, and often do, set higher admission standards. Moreover, the number of spaces available for new graduate students limits the number that can be accepted. Students who apply in their senior year must have completed their baccalaureate work before registration in the Graduate School and must present evidence of such completion. The Graduate School requires the Graduate Record Examination (aptitude test only) for all Ph.D. applicants except foreign nationals. Some departments require the aptitude test for applicants for the master's degree, and some require a Graduate Record Examination advanced test for all applicants. Students whose native language is not English are required to take the *Test of English as a Foreign Language* (TOEFL), administered by the Educational Testing Service, Princeton, N.J. (see page 26). International applicants already in Washington may take the University's English Placement Test in lieu of the TOEFL.

Application for Admission—Applicants who are requesting fellowship support must submit completed applications by February 15 (February 1 for students in clinical psychology and art therapy) for admission in the fall semester and by November 1 for admission in the spring semester. Completed applications for graduate study without fellowship support must be received by July 1 for the fall semester, by December 1 for the spring semester, and by April 15 for the summer sessions, unless otherwise noted.

Readmission—A student who wishes to resume a graduate program which had been interrupted, must file an application form to be considered for readmission. Readmission is not guaranteed, and the application is subject to review by the department concerned and the dean. The student may be required to take qualifying examinations on the course work completed. Application forms are available in the Graduate School Office.

REGULATIONS

Regulations regarding admission, registration, fees, and finances are stated on pages 20-33; other University regulations, on pages 46-53.

In addition, the Graduate School publishes a Student Handbook each academic year which contains updated information on the School's policies, regulations, and other matters of concern to enrolled or admitted students. It is the responsibility of the student to be aware of the information contained in this *Bulletin* and the Handbook.

Grades

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal; *CR*, Credit.

The symbol *I* (Incomplete) indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work for a course. The "Incomplete" must be made up before the lapse of one calendar year. An "Incomplete" for regular course work which is not removed within one calendar year remains permanently as a grade of *I* on the student's record. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

The grade of *I* is also given for all thesis and dissertation research courses until the thesis or dissertation is completed. Upon the satisfactory completion of the thesis or dissertation the grade *I* is changed to *CR* automatically. The grade of *CR* is given for an *Advanced Reading and Research* (usually numbered 398) course.

Scholarship Requirements

Graduate students are required to maintain a minimum accumulative grade average of *B* (3.00) in all course work taken following admission to the Graduate School. Individual departments may require a higher average. The fields of art history and English require a 3.25 average. If the required grade average is at any time not maintained, the student's degree candidacy is subject to termination.

In the case of a student who receives a grade of *F* for a course in the program of studies, the Graduate School will require a written statement from the department justifying the student's continuance in the Graduate School and outlining the program to be followed. Continuation is contingent upon the dean's approval. When a grade of *F* is received for a course in the program of studies, the grade is included in the student's grade point average whether or not the course is repeated.

A student may repeat a course in which a grade of *C* or above was received only when permitted to do so by the department concerned, unless the course description states that the course may be repeated for credit. A written statement to this effect must be submitted for approval to the dean's office by the appropriate departmental advisor. It is then filed with the Registrar. If a course is repeated, the first grade received remains on the student's record and is included in the student's grade point average.

A graduate student may take an advanced undergraduate course (courses numbered 101-200) for graduate credit only upon the approval of the dean and the department at the time of registration. Such approval is granted only with the provision that the student complete additional work in order to receive graduate credit.

Program of Studies

The program of studies must be approved by the dean and the departmental advisor and filed in the Graduate School Office no later than November 1 for graduate students entering in the fall semester, or March 15 for graduate students entering in the spring semester. A program of studies may be revised, when necessary, by obtaining the approval of the departmental advisor and the dean. The revision must be filed in the Graduate School Office. A completed course cannot be dropped from the program of studies unless it is due to an error in advising or an

administrative error. Such a change in the program requires the approval of the dean.

Probationary Students—It is especially important for those admitted as probationary students to consult with their departmental advisor as early as possible regarding completion of special requirements, which are specified in the letter of admission. The exact conditions for admission of probationary students must be satisfied.

Continuous Enrollment

All students must be continuously enrolled while working toward a degree, except during the summer sessions. Students who have completed all course work, thesis, and dissertation registration requirements and who are within their program of studies deadline must register for Continuous Enrollment each semester. There is no charge for this type of registration. If continuous enrollment is not maintained, the student is dropped from the degree program unless a leave of absence is granted by the Graduate School.

Leave of Absence

A student who is temporarily unable to continue the program of studies may request leave of absence for a specific period of time, not to exceed one calendar year during the total period of degree candidacy. When the period of leave has expired, it is the student's responsibility to notify the Graduate School at least two months in advance of a given registration period of intention to reregister. If a student fails to re-register, the candidacy is terminated.

Withdrawal

Graduate students who intend to withdraw from the Graduate School should inform the School in writing. The last day for *complete* withdrawal without academic penalty is at the end of the eighth week of classes.

Graduation Requirements

All students must file an Application for Graduation and pay the required graduation fee at the time of registration for the last semester or summer session of the final year in which they intend to graduate. Students must be registered in the Graduate School during the semester they plan to graduate. Master's and doctoral candidates may graduate in May, February, or September. Students who have completed the requirements for a degree but have not yet been awarded the degree will be issued a letter to this effect upon request.

DEGREES

Listed below are the degree programs of the Graduate School of Arts and Sciences and the specific degrees offered, by field. The programs are directed by the departments concerned. Degree programs which bridge two

or more departments are directed by committees composed of members of the departments concerned. For further information write to the dean or the chairman of the appropriate department.

Students with special academic goals may pursue individualized programs of study toward the Master of Arts or Master of Science, subject to approval by the Committee on Individual Programs and the dean. Courses must be drawn from a minimum of three fields, with a maximum of 18 hours from any one field. A majority of courses must be taken within the Graduate School of Arts and Sciences. Also required is a one-semester colloquium on interdisciplinary methods. The nature of the comprehensive examination is a final essay in which the integration of the program of study is demonstrated. The School also offers Master of Arts and Master of Science degrees in specific academic areas at off-campus locations (see page 103).

Graduate Fields

The graduate course work offered in support of the degree programs in the following list is shown by department in this *Bulletin*.

	Degrees Offered	
I. Humanities		
American Civilization	M.A.	Ph.D.
American Literature	M.A.	Ph.D.
Art	M.F.A.	
Ceramics		
Design		
Graphics		
Painting		
Photography		
Sculpture		
Visual Communication		
Art History	M.A.	Ph.D.
Dramatic Art	M.F.A.	
English Literature	M.A.	Ph.D.
*French Literature	M.A.	Ph.D.
History of Religions—Hinduism	M.A.	
Museum Studies	M.A.	
Music	Mus.M.	
Applied Music		
Composition		
Conducting		
Music Theory		
Musicology	M.A.	
Religion	M.A.	
Religion and Medical Care	M.A.	
Religious Education	M.A.	
Russian Language and Literature	M.A.	
*Spanish-American Literature	M.A.	Ph.D.
*Spanish Literature	M.A.	Ph.D.

* Any approved combination of French, Spanish, or Spanish-American Literature is available as a Doctor of Philosophy field.

II. Social Sciences

Administrative Science	M.A.	
Anthropology	M.A.	
Criminal Justice	M.A.	
Economics	M.A.	Ph.D.
Education Policy		Ph.D.
Employment Policy	M.S.	
Energy Policy	M.A.	
Geography	M.A.	
History	M.A.	Ph.D.
Legislative Affairs	M.A.	
Political Science	M.A.	Ph.D.
Public Policy		Ph.D.
Environmental and Resource Policy	M.A.	
Gerontology	M.A.	
Philosophy and Social Policy	M.A.	
Telecommunications Policy	M.S.	
Women's Studies	M.A.	
Regulatory Policy	M.S.	
Social and Organizational Behavior	M.A.	
Sociology	M.A.	Ph.D.

III. Physical and Mathematical Sciences

Applied Mathematics	M.A., M.S.	
Applied Statistics	M.S.	
Chemical Toxicology	M.S.	
Chemistry	M.S.	Ph.D.
Engineering Geology	M.S.	
Environmental Science	M.S.	
Forensic Sciences	M.F.S., M.S.F.S.	
Geobiology	M.S.	Ph.D.
Geochemistry	M.S.	Ph.D.
Geology	M.S.	Ph.D.
Mathematical Statistics	M.A.	Ph.D.
Mathematics	M.S. for Teachers, M.A.	Ph.D.
Physics	M.A.	Ph.D.

IV. Biomedical and Related Sciences

Anatomy		Ph.D.
Art Therapy	M.A.	
Biochemistry	M.S.	Ph.D.
Biological Sciences	M.S.	Ph.D.
Biology		
Botany		
Zoology		
Genetics	M.S.	Ph.D.
Microbiology	M.S.	Ph.D.
Pathology		Ph.D.
Pharmacology	M.S.	Ph.D.
Physiology	M.S.	Ph.D.
Psychology	M.A.	Ph.D.
Radiological Sciences	M.S.	Ph.D.
Speech-Language Pathology and Audiology	M.A.	

Combined Master of Science and Doctor of Medicine Degrees

Students interested in the combined degrees of Master of Science and Doctor of Medicine must meet the requirements for admission to the Graduate School of Arts and Sciences and to the Doctor of Medicine degree program of the School of Medicine and Health Sciences.

The Master of Science program consists of a minimum of 30 semester hours of credit and the fulfilling of the tool requirement (see pages 97-98). A maximum of 12 semester hours of credit for graduate-level courses *completed as a part of the Doctor of Medicine degree curriculum* (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining 18 semester hours of work, which in most programs incudes a thesis, must be work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

Joint Master's–Juris Doctor Program

Students interested in working concurrently toward the Juris Doctor degree in the National Law Center and a master's degree in the Graduate School of Arts and Sciences must meet the requirements for admission to both schools and all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Dual Program for Doctor of Medicine and Doctor of Philosophy Degrees

A dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements which must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

A student working toward these degrees may apply a maximum of 24 semester hours of approved course work in the School of Medicine and Health Sciences toward the minimum of 48 hours of course work required to qualify for the General or Cumulative Examination for doctoral candidacy. This course work is normally taken during the semesters that alternate with the medical program and in the years following the award of the M.D. degree. The student's research for the dissertation may begin concurrently with the final 24 semester hours of graduate course work leading to the General or Cumulative Examination. The estimated time for the completion of this dual program is six years.

In order to enter the dual degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the dual degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a departmental doctoral committee.

REQUIREMENTS FOR THE DEGREES

The Master's Programs

Unless otherwise specified, the requirements listed below are applicable

to candidates for the degrees of Master of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science for Teachers, and Master of Science in Forensic Science.

1. *General Requirements*—For a master's degree program *including* a thesis, the satisfactory completion of a minimum of 30 semester hours of approved graduate work, including six semester hours of thesis research, is required. For a master's degree program which does *not* include a thesis, the number of semester hours of approved graduate course work is determined by the department, and normally consists of from 30 to 36 semester hours. The program without the thesis is not an individual student option and is not available in every department. Departments can and often do set requirements above the minimum required by the Graduate School.

Work taken to make up deficiencies is never counted as part of the requirements leading to a master's degree. Upon approval, up to one-half of the required graduate work may be taken in courses offered by the other affiliated institutions of the Consortium of Universities of the Washington Metropolitan Area, Inc., or by another degree-granting division of this University. If credit is transferred from another institution (see "Transfer of Credit," below), the number of semester hours which may be taken at an affiliated Consortium institution is reduced by the number of hours accepted as transfer credit.

All master's degree candidates must complete degree requirements by the calendar date specified in the program of studies, which in no case will exceed four years. Extensions beyond the specified time period may be granted in exceptional circumstances, but the student will be required to register and pay for six credit hours of "Reading and Research" each semester.

2. *Academic Work Load*—Full-time students register for nine to 12 semester hours each semester; part-time students must register for six semester hours each semester. These requirements do not apply to students who have fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete their programs. No more than 15 semester hours may be taken during any one semester.

3. *Transfer of Credit*—A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the Graduate School from the Division of University Students, another degree-granting division of this University, or another accredited college or university. For a transfer of credit to be approved *all* of the following conditions must be met: the course work must have been taken prior to admission to the Graduate School, it must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be post-baccalaureate graduate-level course work, it must have been taken within the past two years, and the student must have received a grade of *B* or better in each course for which a transfer of credit is requested. This action must be made in writing and approved by the departmental advisor and the dean. A transcript of the course work must be on file before the request can be considered.

4. *Tool Requirement*—Master's degree candidates in the following programs need not fulfill a tool requirement: Master of Arts in the fields of

administrative science, applied mathematics, art therapy, criminal justice, energy policy, legislative affairs, mathematics, public policy, social and organizational behavior, and speech pathology and audiology (nonthesis option); Master of Forensic Sciences; Master of Music; Master of Science in the fields of applied mathematics, chemical toxicology, employment policy, environmental science, and regulatory policy; Master of Science for Teachers; and Master of Fine Arts in the field of dramatic art. All other master's degree candidates normally must successfully complete a tool requirement in a foreign language, mathematics, statistics, or computer programming, or by graduate course work outside the major department (see option [c] below). In place of a tool requirement, candidates for the degree of Master of Fine Arts in the fields of ceramics, design, graphics, painting, photography, sculpture, or visual communications will complete a methods course selected by the Department of Art.

The tool requirement examination should be passed prior to the beginning of the third semester of graduate work; students who have not fulfilled this requirement must register for the appropriate course at the beginning of the third semester. Students who elect graduate course work outside the major department in order to fulfill the tool requirement must complete this course work before taking the comprehensive examination or undertaking thesis work. Courses taken to satisfy the tool requirement usually cannot be counted in the semester-hour requirement for the master's degree. No master's candidate may attempt a tool examination more than three times. A tool requirement fulfilled at another university cannot be used to fulfill the requirement at this University.

With the approval of the department directing the student's program of study, the tool requirement may be selected from the following options:

(a) Passing a foreign language reading examination (a student may register for the appropriate reading course for nonmajors or make arrangements with the appropriate department to take the examination on the scheduled dates). A student majoring in a foreign language may not select that language to satisfy this requirement. English may not be elected as a tool requirement.

(b) Completing a course in mathematics, statistics, or computer programming which is approved by the appropriate department and by the Graduate School; or passing a special examination covering the approved course material, administered by the appropriate department, at the level of the final examination.

(c) Completing with a grade of *B* or better a minimum of six semester hours of graduate course work in a department other than the student's major department. Three semester hours of this course work will not be counted toward the minimum semester-hour requirement of the student's degree program.

5. *The Thesis*—The main purpose of a master's thesis is to demonstrate the student's ability to make independent use of information and training, and to furnish objective evidence of constructive powers in a chosen field. The student registers for six semester hours of thesis research and must complete the thesis no later than four calendar years after the initial registration. Registration for thesis research entitles the student to the advice and direction of the member of the faculty under whom the thesis is to be written. The thesis subject must be approved by the

faculty member who will be directing the thesis. The thesis, in its final form with one copy and a certificate of approval signed by the thesis director and by at least one departmental reader, must be presented to the dean no later than the date announced in the University Calendar. All theses must meet the form, style, and other requirements set forth in a pamphlet, *Information Concerning Theses and Dissertations*, available in the Office of the Dean.

6. *Master's Comprehensive Examination*—Most master's degree candidates must pass a Master's Comprehensive Examination in the major subject. Examinations are held on dates fixed by the departments, so that results can be filed in the Graduate School Office no later than the day before the faculty meets to approve the list of graduates. The nature and form of the examination is the responsibility of the department or program.

A student who fails to pass the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

The Doctor of Philosophy Program

The minimum requirements for the doctoral program are as follows:

1. *General Requirements*—The program leading to the degree of Doctor of Philosophy requires the satisfactory completion of a minimum of 72 semester hours of approved graduate work for entering students whose highest earned degree is a baccalaureate. A minimum of 48 of these hours must be taken in preparation for the General Examination. Entering students whose highest earned degree is a master's degree are required to register for a minimum of 48 semester hours of approved graduate work, no fewer than 24 of which must be taken in preparation for the General Examination. While completing the dissertation portion of the program, the student must register for 12 to 24 semester hours of dissertation research, depending on the number of hours completed prior to the General Examination. The exact number of semester hours required for any part of the total program is assigned by each department and may exceed the minimum required by the Graduate School.

Doctoral students in the first unit of their programs shall meet the calendar deadline for completing this unit as specified in the program of studies. Completion of the first unit includes satisfactory completion of course work, tool requirements, and the General Examination. Doctoral students in the second unit of their programs, i.e., Dissertation Research, shall have an approved topic on file in the Graduate School Office by the date specified in the program of studies, which in no case will exceed two years from the completion date of the General Examination. All remaining doctoral degree requirements shall be completed by the date specified in the program of studies, which in no case will exceed five years from the completion date of the General Examination. If any of the deadlines specified above are not met, assuming academic approval for an extension, which may be granted in exceptional circumstances, the student must register and pay for six credit hours of "Reading and Research" each

candidate for the doctorate is required, before receiving the degree, to pay a fee to cover the expense of printing the Announcement of the Final Examination, and for the basic service rendered by University Microfilms, Inc.

FELLOWSHIPS AND FINANCIAL AID

A limited number of graduate teaching assistantships and University Fellowships are available in most departments of instruction to students registered in the Graduate School of Arts and Sciences. A limited number of other kinds of sponsored and University awards are also available.

Students applying for admission who also wish to apply for a fellowship should submit the fellowship application and the application for admission by February 15; the necessary transcripts, Graduate Record Examination scores, and letters of recommendation should also be on file by this date. Students currently enrolled in the Graduate School should submit only the fellowship application and have current letters of recommendation on file by February 15.

Forms are available at the Office of the Graduate School of Arts and Sciences. Filing the fellowship application entitles the student to consideration for all awards available in the student's department.

Students who wish to apply for loans should indicate their intent to do so on the application for admission. Information concerning loans is contained in a booklet, *Student Financial Aid*, available from the University's Student Financial Aid Office.

COOPERATIVE PROGRAMS

The American Studies Program at George Washington University is affiliated with the American Studies Program of the Smithsonian Institution. This arrangement offers students in the field of American civilization an opportunity to take advantage of the Washington environment. Members of the staffs of the Smithsonian's American Studies Program, National Museum of American History, National Portrait Gallery, and National Collection of Fine Arts offer seminars and tutorial instruction in fields which provide students with an unusual opportunity to develop new dimensions in the discipline of American civilization. This program of study is open to students working toward the degrees of Master of Arts and Doctor of Philosophy, and is intended to prepare them for research, teaching, and museum-related careers.

The Art Department of George Washington University and the Smithsonian Institution offer a joint graduate program of study and research in museum studies leading to the degree of Master of Arts in the field of Art History with a concentration in Museum Training. The Department has also established a program of study in affiliation with the Corcoran Gallery of Art, the Freer Gallery, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Museum of American Art, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

A program of study leading to the degree of Doctor of Philosophy in American Civilization with emphasis on library research and collections is

offered jointly by George Washington University and the Library of Congress. The coordinator of the Library Program and the staff offer an orientation seminar and other courses and supervise students in reading and research and in work on such library problems as indexing, cataloguing, and bibliography.

For further information concerning these programs contact one of the following offices at George Washington University: the Graduate School of Arts and Sciences for those who are interested in any of the fields listed above, the Art Department for those interested in art museum training, the American Studies Program for those interested in the field of American civilization.

George Washington University, in cooperation with two other universities and the Folger Shakespeare Library, helped establish the Folger Institute for Renaissance and 18th-century Studies as a cooperative venture in graduate studies in the humanities. Fifteen universities are now member institutions. Seminars (limited to 12 students each) are offered each semester under the direction of American and foreign scholars. The Folger Library forms the core of the Institute. All participants enrolled in the seminars are granted access to the collections of rare books, manuscripts, and reference materials of the Library. All registered students are eligible to apply for admission to one or more of the seminars, although priority in enrollment will be accorded graduate students working on dissertations and postdoctoral scholars from the sponsoring institutions.

Further information, including a listing of seminar topics, is available in the Office of the Graduate School of Arts and Sciences or at the Folger Shakespeare Library.

The University and the National Bureau of Standards have entered into a cooperative agreement to further educational opportunity at both the University and the Bureau. This arrangement holds promise for graduate study and research, with emphasis in the physical sciences.

OFF-CAMPUS DEGREE PROGRAMS

The Graduate School of Arts and Sciences is currently offering the following degree programs off campus: (1) the Master of Arts in the fields of Administrative Science, Criminal Justice, Energy Policy, Legislative Affairs, Public Policy (with concentrations in Environmental and Resource Policy and in Telecommunications Policy), and Social and Organizational Behavior; (2) the degree of Master of Forensic Science; and (3) the degree of Master of Science in the fields of Employment Policy, Environmental Science, Regulatory Policy, and Social and Economic Statistics. Not all these programs may be available in any given year.

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Dean E.W. Kelly, Jr.
Assistant Dean R.E. Baker

FACULTY 1982-83*

Professors R.E. Baker, J.G. Boswell, J.L. Breen, F.J. Brown, M. Burns, R.S. Cottrell, Jr., L.H. Elliott, R. Ferrante, E.J. Gleazer, Jr. *(Visiting)*, D. Hawkins, J.C. Heddesheimer, G.L. Horrworth, J.D. Hunt, R.K. Ives, S. Kavruck, E.W. Kelly, Jr., E.P. Kulawiec, D. Linkowski, D.A. Moore, L. Nadler, S.R. Paratore, D.C. Paup, M.N. Rashid, J.R. Shotel, G.W. Smith, J.E. Snodgrass, L.M. Stallings, C.S. Tidball, C.E. Vontress, L. Winkler

Associate Professors M.S. Castleberry, J.D. Fife, L.H. George, J.A. Greenberg, D.H. Holmes, N.D. Johnson, R.I. Peterson, N.J.S. Sobel, L.A. Tsantis, G.D. Wiggs, M.R. Withers

Assistant Professors P. Finnerty-Fried, M.B. Freund, G.L. Harbin, C.H. Hoare, R.N. Ianacone, E.R. Lilly, R.A. Luke, A.J. Mazur, H. Nashman, J.R. Snider *(Visiting)*

Instructors A.H. Farbman, D.M. Hiltenbrand, C.B. Stapp, M. Thomas

Members of the Advanced Graduate Faculty

R.E. Baker, J.G. Boswell, J.L. Breen, F.J. Brown, M. Burns, M.S. Castleberry, R.S. Cottrell, Jr., L.H. Elliott, R. Ferrante, J.D. Fife, M.B. Freund, J.A. Greenberg, D. Hawkins, J.C. Heddesheimer, G. Horrworth, J.D. Hunt, R.N. Ianacone, R.K. Ives, N.D. Johnson, E.W. Kelly, Jr., E.P. Kulawiec, E.R. Lilly, D. Linkowski, R.A. Luke, A.L. Mazur, D.A. Moore, L. Nadler, S.R. Paratore, D.C. Paup, R.I. Peterson, M.N. Rashid, J.R. Shotel, G.W. Smith, J.E. Snodgrass, N.J.S. Sobel, L.M. Stallings, C.S. Tidball, L.A. Tsantis, C.E. Vontress, G.D. Wiggs, L. Winkler

Committees†

EXECUTIVE COMMITTEE

J.L. Breen, M.S. Castleberry, R. Ferrante, D. Linkowski, R.A. Luke, M.N. Rashid

CURRICULUM COMMITTEE

J.A. Greenberg, J.C. Heddesheimer, D.H. Holmes, R.K. Ives, E.R. Lilly, L.M. Stallings

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of the School of Education and Human Development.
† The dean and the assistant dean of the School of Education and Human Development are *ex officio* members of all committees.

FACULTY COMMITTEE

P. Finnerty-Fried, J.A. Greenberg, R.N. Ianacone, E.P. Kulawiec, J.R. Shotel, J.E. Snodgrass

SCHOOL, COMMUNITY, AND ALUMNI AFFAIRS COMMITTEE

M.B. Freund, H. Nashman, L.A. Tsantis, G.D. Wiggs

STUDENT COMMITTEE

L.H. George, G.L. Horrworth, A.J. Mazur, H. Nashman

INTRODUCTION

The University began offering professional courses for teachers in 1904-05, and in 1907 it established a Division of Education. In 1909 the Division of Education became the Teachers College which in its early years was concerned largely with teacher preparation on the undergraduate level.

In 1928 the Teachers College became the School of Education and greater provision was made for advanced study. Since that time the graduate enrollment has steadily increased, with the result that today the School has a considerably larger number of graduate than undergraduate students. To reflect the current scope of its offerings, the name of the School was changed in 1977 to the School of Education and Human Development.

The School of Education and Human Development prepares teachers, resource and support personnel, and administrators for educational service. The School also offers opportunities to experienced teachers to extend and enrich their education. The programs are designed to meet the broad needs of all persons who seek the knowledge and skills necessary to provide for effective learning and teaching. The School's programs focus on the needs of persons interested in the traditional elementary and secondary school environments, but also include the preparation of individuals for all areas of education covering the life span from pre-school through the adult years in both the public and private sectors of society. The following undergraduate programs are representative: human services, dance therapy, travel and tourism, and exercise and sport. The following Master's degree programs are representative: administration of college student development services, adult education, dance, early childhood education and early childhood special education, educational and national development, gifted and talented, higher education, international education and human resource development, perceptual motor development, psychoeducator for emotionally disturbed adolescents, rehabilitation counseling, special education for adjudicated youth, therapeutic recreation, tourism development and travel administration.

A Bachelor of Arts in Education and Human Development is more than preparation for teaching in schools. The degree provides background and experiences for careers in a variety of public and private settings. A majority of the credit hours of required courses are in the liberal arts. In addition, the programs provide opportunities for students to develop critical thinking and reasoning, as well as leadership, organizational, and planning skills. Emphasis is placed upon developing the human relation-

ship qualities that are essential in fields that require involvement with people in all age ranges and from all walks of life.

The School of Education and Human Development is the administrative unit for three departments: Education, Human Kinetics and Leisure Studies, and Special Education. In addition to programs of study leading to its degrees, the School offers credit and non-credit workshops designed specifically to meet the unique needs of metropolitan area school systems, and other clienteles in private industry and in government.

Special curricula are tailored on an individual basis for liberal arts graduates and graduates of other professional schools who are interested in teaching or in other human services areas. The School also offers a wide range of courses for teachers who wish to renew licenses and for provisional teachers who wish to prepare for teaching certificates.

Laboratory and clinical facilities are provided by the University Reading Center. Field experiences are provided in cooperation with public and private schools, social and health agencies, museums, institutions in the business community, and community and junior colleges.

The schedule of courses is arranged to meet the convenience of both full-time and part-time students.

Professional Courses for Non-Education Majors

Columbian College students in a number of major fields are permitted to use their electives to complete up to 18 credit hours of professional education courses required for teaching in junior and senior high schools. Students may graduate with 120 semester hours or may choose to complete all courses required for teacher certification and graduate with a program in excess of 120 semester hours. Students interested in taking these courses should contact the office of the dean of the School of Education and Human Development for advising.

Freshmen and sophomore students may take professional education courses that include field work experiences. Some of these courses make it possible for students who are undecided about their choice of a career to have an opportunity to test teaching and some of the many related helping services areas.

A number of professional education courses are open to non-education majors. It is recommended that students check with one of the three education departments for more specific information on courses that are open.

Education for Teaching

Programs of study in education for teaching are based upon the assumption that every teacher should have a broad general education, mastery of the content of instruction, and professional competencies.

The relative emphasis placed upon each of these aspects of the total education for teaching varies in accordance with the purposes of each program. For instance, since elementary school teachers teach all subjects, they require content preparation of greater breadth and less specialization than secondary school teachers.

It is the view of the School of Education and Human Development that an acceptable minimum education for teaching requires four years of full-

time study or the equivalent in part-time study. For superior preparation teachers are urged to plan for five years of full-time study or the equivalent in part-time study.

The student may choose any one of the following plans to achieve superior educational preparation for teaching or for other education-related fields:

1. Upon receiving the bachelor's degree in education, he or she may take a teaching position and, after acquiring some professional experience, return to the School for graduate study leading to the master's degree. This plan enables students with bachelor's degrees to begin their teaching careers, and to use their work experience to enhance graduate study which will follow.
2. The student may choose to pursue full- or part-time graduate study leading to the master's degree immediately after receiving the bachelor's degree.
3. A student whose bachelor's degree is in one of the liberal arts disciplines may choose to complete the requirements for certification for teaching by studying in one of the teaching fields in a program custom-tailored to his or her particular needs.

REGULATIONS

University regulations concerning admission, registration, fees, and finances are stated on pages 20-33; other University regulations, on pages 46-53.

General Scholarship Requirements for Undergraduates

Regulations regarding academic standing, probation, suspension, withdrawals, classification of students, required placement examinations and waiving introductory courses by examination are the same as those for Columbian College; they appear on pages 70-71 and 75-77 of this *Bulletin*.

ACADEMIC WORK LOAD

Fifteen to 17 semester hours of credit constitute a normal program. A student with a quality-point index of 3.00 or higher may, with the permission of the dean, enroll for 18 or 19 hours. No student may enroll for more than 19, except by permission of the Committee on Scholarship.

The following work load regulations apply to both graduate and undergraduate students.

Students employed 15 hours or less a week may carry a normal program of college work.

Students employed from 16 to 25 hours a week may enroll for 12 or 13 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean,* enroll for 15 or 16 hours.

Students employed from 26 to 34 hours a week may enroll for 9 or 10 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean,* enroll for 12 or 13 hours.

* Request forms are available at the office of the dean. They should be filled out and returned to the office of the dean at least two weeks prior to registration.

Students employed 35 hours or more a week may enroll for 6 or 7 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean,* enroll for 9 or 10 hours.

Students who increase their hours of employment after registration or at any time during a semester must report immediately to the dean so that their programs may be adjusted, if necessary.

Graduate students employed full-time may take a maximum of 6 semester hours, unless special permission to take more is granted by the dean.*

REQUIRED PLACEMENT EXAMINATIONS

English—Students whose College Board English Composition Achievement Test scores suggest that they will benefit from more intensive training in compositional skills may be assigned to English 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10.

Foreign Languages—A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion of the examination, assignment is made to the appropriate course.

Mathematics—New students accepted for registration in Math 30 are required, prior to registration, to take a placement examination in algebra and trigonometry; those wishing to register in Math 51 are required, prior to registration, to take a placement examination in algebra. (See specific mathematics requirements listed under elementary or secondary education majors.)

EARNING CREDIT BY EXAMINATION

Undergraduate students may earn semester-hour credits up to a maximum of 30 hours by performing satisfactorily on College-Level Examination Program (CLEP) Tests or special departmental examinations provided by the departments of Columbian College of Arts and Sciences on an individual basis. Passing a waiver examination does not entitle the student to any semester hours of credit in the School of Education and Human Development. A limited amount of credit may be assigned for selected service school instruction received since 1941.

Students interested in becoming certified to teach who have earned bachelor's or graduate degrees in fields other than education may satisfy some certification requirements by taking the CLEP Examinations or special departmental examinations. See pages 22-23 for general information on the CLEP tests, and for information on special examinations offered by departments.

THE BACHELOR'S DEGREES

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and

* Request forms are available at the office of the dean. They should be filled out and returned to the office of the dean at least two weeks prior to registration.

Human Development (elementary and secondary education, elementary education/early childhood education, special education: complementary teacher program, and human services) and Bachelor of Science in Human Kinetics and Leisure Studies (elementary/secondary physical education, dance education, dance therapy, dance as a performing art, exercise and sport, and travel and tourism).

Bachelor of Arts in Education and Human Development

The programs leading to the degree of Bachelor of Arts in Education and Human Development (elementary and secondary education, elementary education/early childhood education, and special education: complementary teacher program) are planned to provide (1) general educational backgrounds, (2) functional command of concepts and skills in one or more teaching fields, (3) mastery of basic professional information and skills adequate for the beginning teacher, and (4) development of attitudes needed for success in teaching or in other related human services fields.

The general educational backgrounds needed by prospective teachers or by persons interested in being employed in other human services fields are obtained through college courses, work experience, leadership activities, and off-campus cultural opportunities.

As part of formal course work, and on their own initiative, students of the School of Education and Human Development are expected to take full advantage of the many opportunities in the Washington area for developing leadership skills. Advisors are available to help students plan these experiences.

Persons preparing for teaching or for work in other human services fields require a well-rounded education. Therefore, a student completing the teacher certification program will take from 72 to 96 semester hours in the liberal arts. Liberal arts courses and selected professional education courses may be completed at George Washington University or may be accepted for advanced standing from another accredited institution in accordance with regulations on page 108.

Experienced registered nurses and persons engaged in or interested in related health services or other human services areas may fulfill the requirements for a B.A. in Education and Human Development in the field of human services.

General Information for Freshmen and Sophomores

All undergraduates admitted directly to the School of Education and Human Development are assigned academic advisors at the time of admission. Advisors are designated to provide continuity of advising for students throughout their years of undergraduate study. The program for each student must be approved by a faculty advisor.

Since each student's program is defined by individual needs, it is important that students have a clear concept of their major interest in education, and that they be familiar with the certification requirements of those localities in which they expect to teach. Information on state licensing requirements is available in the Career Services Center, located in the Academic Center.

Entrance Requirements for Freshmen and Sophomores

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman and/or sophomore years are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least fifteen units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college preparatory mathematics.

2. The principal's statement that the applicant is prepared to undertake college work.

3. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test.

It is recommended that the examinations be taken in December or January of the senior year. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08540; or 1947 Center St., Berkeley, Cal. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

The School of Education and Human Development will consider the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all of the formal requirements stated above. The School may require appropriate scholastic-aptitude tests. Students admitted with deficiencies in secondary school units will be required to begin removing such deficiencies within the first year, by appropriate courses or examinations.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting such a certificate must also show competence in the English language and may be required to enroll in a full-time program in English as a Foreign Language before beginning studies in a degree program. Requirements will be determined on the basis of an English Proficiency Test administered on-campus. A candidate who submits a score of 580 or above on the Test of English as a Foreign Language (TOEFL) may be excused from taking further course work in English as a Foreign Language, but will be required to take the English Placement Examination on campus.

Students who have been out of secondary school for three years or more or do not meet the above requirements may take a special battery of

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* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

admission tests by contacting the Office of Admissions or may be considered for admission on probation to the School of Education and Human Development. A student admitted on probation is required to complete a trial program of 15 semester hours of course work with a quality-point index of 2.25 or higher. The selection of courses to be taken in the trial program must be made in conference with a faculty advisor.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities, and from other divisions of this University, are as follows:

Students who have accumulated 15 hours or more of academic credit at another regionally accredited college or university with an acceptable program and acceptable grades may be admitted to the School of Education and Human Development. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of *C* or better, and may be applied toward a degree provided that such courses are comparable to the curriculum requirements of the degree at GW.

Although a grade of *D* in a course is not acceptable for transfer, the course may be used to satisfy a curriculum requirement. Credits earned with a *D* grade may not, however, be counted toward advanced standing.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Students may transfer from another division of this University into a degree program in the School of Education and Human Development. The student must present an accumulated quality-point index of 2.00 or higher at the time of transfer. A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curriculum requirements of the degree.

Nurses filing for admission to the B.A. program in Human Services are required to submit a copy of their current state nurse's registration (license) in addition to the official transcripts. Nurses may be awarded advanced standing for work completed in a community or junior college program. They may also receive advanced standing up to 30 credit hours for work completed in a two-year teaching hospital program; 45 credit hours may be granted for work completed in a three-year teaching hospital program.

Students applying for transfer from another accredited college or university or from another division of this University whose previous academic records raise doubts of their ability to complete degree requirements successfully may be admitted to the School of Education and Human Development on probation. To be admitted into the School's degree

program, a conditionally admitted student must complete a prescribed trial program of 15 semester hours of course work with a quality-point index of 2.25 or higher. A student registered in another division of this University who has an accumulated quality-point index of less than 2.00 and who is conditionally admitted to this School must earn a 2.25 quality-point index in the trial program and must during this trial program bring the accumulated quality-point index to 2.00 or higher to be admitted to the School's degree program.

The selection of courses to be taken in the trial program must be made in conference with a faculty advisor in the School of Education and Human Development. A conference concerning plans for study as a degree candidate is required of each applicant at the beginning and end of the trial program. Upon successful completion of the trial program, the student who has submitted a degree-candidate application will be advanced to degree status.

Requirements for the Degrees

To be recommended for a degree a student must satisfy the admission, residence, scholarship, and curriculum requirements. The amount of course work required for bachelor degrees is as follows:

Bachelor of Arts in Education and Human Development—elementary education, elementary education/early childhood education, and special education: complementary teacher program, a minimum of 126 semester hours; secondary education and human services, 126 semester hours.

Bachelor of Science in Human Kinetics and Leisure Studies—dance therapy, 131 semester hours; elementary/secondary physical education, dance education, and dance as a performing art, 124 semester hours; exercise and sport, and travel and tourism, 120 semester hours.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily a minimum of 30 semester hours while in the School of Education and Human Development.

DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a quality-point index of 3.5 on courses completed during the past semester. A part-time student, to be eligible, must obtain a quality-point index of 3.5 on the last 12 semester hours of course work. Such part-time students must have been enrolled for at least one three-hour course each semester, and residence during the period involved must be continuous.

SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see page 46.

In order to graduate, a student must have a quality-point index of at least 2.25. A quality-point index of at least 2.25 is required before permission is granted to do student teaching in the senior year.

Probation—A student who fails to maintain a quality-point index of at least 2.25 is placed on probation. The student remains on probation as long

as the index is below 2.25, or until probation is removed by the Committee on Scholarship.

Suspension—A student on probation who fails to raise the index to 2.25 within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, appeal the case through the dean to the Committee on Scholarship. If the case appears to be remediable and the student's scholarship seems likely to improve, the Committee may readmit the student on probation. A student denied readmission may again, after a lapse of a calendar year, petition the Committee through the dean for readmission. A student suspended twice will not be readmitted.

CURRICULUM REQUIREMENTS

In all bachelor's curricula at least 30 semester hours must consist of courses numbered above 100.

PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of an advisor and the dean, take one course a semester and receive a grade of *P* (Pass) or *NP* (No Pass) which will be recorded on the student's transcript but will not be reflected in the student's quality-point index. No student will be allowed to take more than four pass/no pass courses. Students must sign up for such an option at registration. Students may change from pass/no pass status to graded status, or vice versa, after the end of registration only with the permission of the dean and the course instructor. Courses required in the student's major field may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment at this University.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 47.

Removing an Incomplete—When a grade of *I* is assigned, the instructor should normally set a period within which the uncompleted work (usually the final examination or a required paper) must be made up. When required work has been completed, it is the responsibility of the instructor to change the grade of *I*, as appropriate. If work is not completed, the instructor will decide whether to change the grade of *I* to *F*, or to allow the *I* grade to remain. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

National Teacher Examination

The National Teacher Examination is optional for Education students. Students who take the Examination receive individual reports of test scores and may avail themselves of the regular transcript services of the Educational Testing Service.

Teaching-Field Programs

SUBJECT-AREA SPECIALIZATION

Subject-area specialization depends upon the teaching position for which the student is preparing. Those planning to teach in elementary schools need a degree of competency in several fields. Those preparing to teach in junior or senior high schools must demonstrate competence in a major teaching field. A minor teaching field is optional, but recommended. The student should begin teaching-field preparation during the first two years.

Teaching-field requirements for secondary education majors, developed in cooperation with appropriate liberal arts departments of the University, include satisfactory completion of prescribed academic courses in one or more fields and satisfactory completion of the prescribed special methods courses. Prescribed academic courses vary in number in accordance with the scope and complexity of the teaching field and the licensing requirements of the various states.

Professional Education

The basic professional information, skills, and attitudes needed by beginning teachers are provided through a sequence of courses to be taken throughout the four years of undergraduate study. Lectures and class discussions are closely coordinated with field work. Instruction is differentiated to meet the needs of those preparing to teach on the various levels—elementary, junior high, and senior high school.

The prescribed courses in special methods are concerned primarily with methods of initiating, guiding, and evaluating learning experiences dealing with the content of teaching fields. They attempt to bring to the student specific suggestions drawn from the accumulated experience of successful teachers. In addition, the courses review the teaching-field content currently in use in schools.

Education Curriculum

The following is the curriculum for the first two years in preparation for the Bachelor of Arts in Education and Human Development degree with major fields in elementary or secondary education, elementary education/early childhood education, and special education: complementary teacher program.

		Semester Hours
Education/ Special Education:	Educ 50, 71, 72, 104 (for students in elementary and secondary education and the double-major program); SpEd 157, 158, 201, and Educ 102, 104 (for special education majors)	12–15
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12
Mathematics:	Math 9 and 10 (for students in elementary education, special education, and the double-major program); two semesters chosen from Math 3, 6, 9, or 10 (for secondary education majors)	6

		Semester Hours
Science:	Three semesters (two in biological science and one in physical science or vice versa) for students in elementary education, special education, and the double-major program); two semesters for secondary education majors. Courses are to be chosen from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; or Phys 1 and 2, or 9–10	6–9
Social Sciences:	Hist 71 or 72 and another social science course (for students in elementary education, special education, and the double-major program); Hist 71–72 or PSc 1 and 2 (for secondary majors)	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2; Soc 1 and 2	6
Speech and Drama:	SpDr 1 or as approved for secondary majors; SpDr 11 for students in elementary education, special education, and the double-major program.	3
HKLS:	For students in elementary education, special education, and the double-major program	3
Electives:	.....	6–9
	Total	60–63

Professional Studies Component—Second-semester sophomore students in teacher preparation programs (elementary education, secondary education, elementary education early childhood education, and special education: complementary teacher program) must file an application for permission to complete the professional studies component in the junior and senior years. Applications may be obtained in the Office of the Dean or the Office of Laboratory Experiences. Academic advisors must recommend students for the professional studies component. A writing sample is required.

Students with an education major must be approved for student teaching in the eighth semester by their academic advisors. A grade-point average of 2.25 on a 4.0 scale is required. Also required will be a valid medical certificate indicating that the student has taken a T.B. test and is free of tuberculosis.

Human Kinetics and Leisure Studies Curriculum

Students interested in the Bachelor of Science in Human Kinetics and Leisure Studies with a specialization in elementary/secondary physical education will be admitted to the major in human services to complete the following courses during the first two years and will be admitted to the major in elementary/secondary physical education in the junior year. (Students should begin to acquire competency in several physical activities in the first two years.)

Education:	Educ 71, 72	6
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12

		Semester Hours
HKLS:	Four semester hours selected from first-group HKLS courses (59, 60, 61, 62 recommended); HKLS 102, 103, 111–12, 130, 139, 150, 151	28
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; or Phys 1 and 2, or 9–10	8
Social Sciences:	Hist 71–72 or PSc 1 and 2	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2; Soc 1 and 2	6
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with a specialization in dance education:

English:	Engl 9 or 10 and 11	6
HKLS:	HKLS 107, 108, 150, and 157.	12
	Any combination of dance courses numbered 10–58, 121 or 123	16
Education:	Educ 50, 71, 72	9
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9–10; Phys 1–2, or 9–10	6
Social Sciences:	Hist 71–72 or PSc 1 and 2	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; PSc 1 and 2; Soc 1 and 2	6
Speech and Drama:	SpDr 1, 11, 121 or 169	3
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students interested in dance as a performing art:

English:	Engl 9 or 10 and 11	6
HKLS:	HKLS 150, 157	6
	Any combination of dance courses numbered 10–58, 121 or 123	6
Humanities:	Art 21–22, 31–32; Music 1, 3 or 4; Phil 50; SpDr 45	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2, 5; Math 3, 6, 9, 10; Phys 3, 4, 9, or 10	6
Social Sciences:	AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40, 71–72; PSc 1 and 2; Psyc 1, 5–6, 8, 22, 29; Soc 1 and 2	6
Electives:		24
	Total	60

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students in dance therapy:

English:	Engl 9 or 10; 11 or 12	6

		Semester Hours
Speech and Drama:	SpDr 2, 115, or 121	3
Humanities:	One philosophy, music, or art history course	3
Science:	BiSc 3-4	6
Social Sciences:	Psyc 5, 101, 110, 119, 122; Soc 1; Anth 2	22
Education:	Educ 71, 72	6
Dance Technique:	Courses chosen from HKLS 10–58; HKLS 121, 123	10
Electives:	Three courses chosen from Psyc 8, 108, 118, 151 are recommended	9
	Total	65

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students interested in exercise and sport:

English:	Engl 9 or 10; 11 or 12	6
Social Sciences:	Four courses selected from AmCv, Anth, Econ, Geog, Hist, PSc, Psyc, Soc	12
Science:	Two courses selected from BiSc, Chem, Geol, Phys	6
HKLS:	HKLS 103, 129, 130, 150, 151, 158, 159, plus four HKLS courses selected with advisor's approval	33
Electives:		3
	Total	60

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students interested in travel and tourism:

English:	Engl 9 or 10, 11, 101	9
Social Sciences:	Econ 1–2; two courses selected from Psyc 1, Soc 1, Geog 1, Anth 1, PSc 1	12
Mathematics:	Math 9 and 10	6
Science:	BiSc 3–4, Chem 3–4, Geol 1–2, Phys 1–2 or 9–10	6
Speech and Drama:	SpDr 1 or 2	3
Humanities:	Two courses in art, literature, music, or a foreign language	6
Education/HKLS:	Educ 161; HKLS 104	3
Other:	BAd 51 or Acct 51; Stat 51 or 53 and 107	9
Electives:	To be selected with advisor's approval	3
	Total	60

The teaching-field programs and their requirements are as follows:

Elementary Education Program

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATION

The requirements are three semester hours each, to be selected with approval of the advisor, of art and music survey courses (may be taken on a *P/NP* basis) and HKLS 122; 9-12 hours of science courses (must include courses in both physical and biological sciences) and 6 hours of social science courses, to be selected with approval of the advisor; Econ 1; Geog 1 and 2; Hist 71 or 72; Math 9, 10. (Some of these courses are listed above as requirements under general education.)

PROFESSIONAL COURSES

Forty-two credit hours are required, consisting of Educ 105, 110, 111, 112, 128, 135. These courses are in addition to Educ 50, 71, 72, and 104 taken during the first two years.

Special Education: Complementary Teacher Program

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATION

Same as the elementary education program above, plus Psyc 101.

PROFESSIONAL COURSES

The required courses are SpEd 102, 189, 170, 103, 190, 101, 199, 160, and 168; Educ 110, 112, 118, and 128.

Elementary Education/Early Childhood Education

The general education, subject-area specialization, and professional courses are the same as those required for elementary education. In addition, students are required to complete Educ 132, 150, 152, 153, and 154.

Secondary Education Programs

In the secondary education program a number of teaching-field specializations are offered. However, it is strongly recommended that, wherever possible, a candidate undertake the equivalent of a minor in an interdisciplinary subject area. Early counseling by the program advisor is urged to ensure a balanced and realistic program of study. The requirements in the secondary education program are as follows:

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATIONS

Art—42 credit hours, including Art 1 and 31-32 or 71-72, and two second- or third-group art history courses if open to undergraduates; Art 137; 24 credit hours to be selected from the following: Art 21-22, 23-24, 41-42, 51-52, 57-58, 65-66, 81-82, 123-24, 125-26, 127-28, 131-32, 143-44, 151-52, 153-54, 159-60, 163-64, 166, 179-80, 181, 182, 189-90, 235.

Biology—44 credit hours, including BiSc 11-12; 24 credit hours in upper-level biological science courses; Chem 11-12 and 50.

Chemistry—40-44 credit hours, including Chem 11-12 and 22 or 15-16, 110 or 111, 134, 151-52, 153-54, 191; Math 6, 30, 31; Phys 1 and 2.

Earth Science—49-52 credit hours, including BiSc 3-4; Chem 11-12; Geol 21-22, 101, 111, 125, 151; Math 3 and 6; Phys 1; 6-9 additional credit hours, as approved by the advisor, to be selected from the following: Anth 186; Geol 122, 128, 141, 163, 189.

English—39 credit hours, including Engl 9 or 10, 11 or 12, 52, 71-72, 101, 115 or 117, 127-28; SpDr 11; and nine credit hours to be selected from the following as approved by the advisor: Engl 133-34, 135-36, 153-54, 155-56, 161-62, 163-64, 165-66, 167-68, 171-72, 173-74, 177-78.

French—42 credit hours, including Fren 9, 10, 51-52 or 91-92, 103, 108, 109, 110, and two full-year second-group French literature courses; 6 semester hours from the following: Art 109, 110; Engl 115; a foreign language other than French as approved; Hist 141-42; Psyc 115.

General Science—43-45 credit hours, including BiSc 3-4; Chem 11-12 or 15-16, and 22; Phys 1 and 2 or 9-10; 10 additional credit hours in science as approved by the advisor; 9 credit hours of math to be selected from the following: Math 3, 6, 30, 31, 32, 33.

Geography—24 credit hours, including Geog 1; 3 credit hours selected from Geog 104, 105, 106; 6 credit hours selected from Geog 127, 133, 145, 146, 151, 154, 161; 6 credit hours selected from Geog 2, 124, 125, 140, 141, 143; and 6 credit hours selected from Geog 3, 107, 108, 132, 134, 135, 136, 137, 142.

German—33 credit hours, including Ger 9-10, 51-52, 179-80, and 15 additional credit hours in German as approved by the advisor.

History—42 credit hours, including Hist 39-40 and 71-72; 6 credit hours of a history research seminar; 6 credit hours in each of the three following groups as approved by the advisor: Europe; United States; and Russia, Asia, Africa, and Latin America; 6 additional credit hours as approved by the advisor, in any one of the preceding groups.

Mathematics—39 credit hours, including Math 30, 31, 32, 33, 121, 123 or 124, 135; three additional second- or third-group mathematics courses approved by the advisor; Stat 107, 157-58.

Music—48 credit hours, including Mus 2, 5, 6, 103, 104, 131, 132, 138, 151; 6 credit hours of applied music (voice or major instrument); 12 credit hours of applied music (minor instruments other than major, including piano, voice, guitar); ensemble.

Physics—36 credit hours, including Math 30, 31, 32, 33; Phys 14, 15, 16, 161, 163, 164, 165, 167.

Russian—36 credit hours, including Slav 9-10, 91-92, 109-10, 161-62; 12 credit hours of electives in both language and literature from Slav 101, 125, 141, 151, 152, 165, 166.

Social Sciences—42 credit hours, including Econ 1-2; Hist 39-40, 71-72; PSc 1 and 2; 6 credit hours to be selected from the following: Anth 1-2; Geog 1, 2; Soc 1, 2; plus 12 credit hours of second-group courses, as approved by the advisor, from anthropology, economics, geography and regional science, history, political science, and sociology.

Spanish—42 credit hours, including Span 9-10, 51-52 or 91-92, 109-10; three full-year courses selected from second-group Spanish or Spanish-American literature courses; 6 credit hours to be selected from the following: Anth 115, 170, 172, 185; Art 110, 114, 116, 121-22, 147; Engl 115; a

foreign language other than Spanish as approved; Geog 115, 161; Hist 161, 162, 163-64, 165, 166; PSc 183-84; Psyc 115.

Speech and Drama—39 credit hours, including SpDr 1, 11, 32, 45, 49, 101, 103, 112, 121; plus 12 credit hours to be selected from speech communication (SpDr 126, 127-28, 133, 134, 143, 144), drama (SpDr 115, 116, 151-52, 154, 155-56, 165-66), or radio-television (SpDr 75, 133, 134, 137-38, 145, 147, 149), as approved by the advisor.

PROFESSIONAL COURSES*

The requirements are 21 to 27 credit hours, consisting of Educ 105, 223 (for undergraduate credit), 112, 131, 134 (6-9 credit hours), and 3 credit hours selected from Educ 136, 137, 138, 139, 140, 144, 146. These courses are in addition to the following courses, usually completed during the first two years: Educ 50, 71, 72, 104.

Bachelor of Science in Human Kinetics and Leisure Studies

The programs are designed to prepare students for teaching and industry.

Prerequisite—For the first two years of the Bachelor of Science in Human Kinetics and Leisure Studies curriculum, see pages 115-16.

Specialization in Dance Education, junior and senior years—The following courses are required: Educ 104, 112; HKLS 109-10, 117, 119, 133, 135-36, 137, 141-42, 144, 150, 151, 175, 200; plus 9 credit hours of electives.

Specialization in Dance as a Performing Art, junior and senior years—The requirements consist of 20 credit hours selected from HKLS 10-58, 121, or 123; and HKLS 108, 109-10, 120, 135-36, 137, 141-42, 144, 173, 175; plus 9-11 credit hours of electives.

Specialization in Dance Therapy, junior and senior years—10 credit hours selected from HKLS 10-58; HKLS 106, 107, 108, 109, 110, 113 or 114, 117, 119, 120, 136, 137, 141, 142, 144, 150, 157, 173, 175, 184.

Specialization in Elementary/Secondary Physical Education, junior and senior years—60 credit hours are required: SpDr 1 or 11; Educ 104, 105, 112; HKLS 113, 114, 129, 138, 158, 164, 171, 133; plus 12 hours of an HKLS area of concentration and nine hours of electives.

Specialization in Exercise and Sport, junior and senior years—60 credit hours are required: Engl 51 or 71 and Engl 52 or 72; SpDr 1, 11, or 111; HKLS 113, 114, 138, 139, 164, 171, plus two additional HKLS courses to be selected with advisor's approval; 27 hours of electives selected from Educ 72, 104, 105, 112; HKLS 104; BAd 102, 105; Jour 116; Stat 107; or other courses as approved by the advisor.

Specialization in Travel and Tourism, junior and senior years—60 credit hours are required: BAd 141; Psyc 105; HKLS 114, 190, 191, 260, 261, 262; 15 credits of other HKLS courses; 21 credits of restricted electives.

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* A course in the teaching of reading is recommended since it is required for employment in many jurisdictions.

Bachelor of Arts in Education and Human Development—Human Services Program

The Human Services Program is designed for persons who are employed, or who wish to work, in the following representative types of human service areas: hospitals and health care agencies, residential centers, cultural institutions, drug and alcohol abuse rehabilitation programs, correctional institutions, and voluntary agencies.

The Human Services Program enables students to: (1) develop knowledge of the diverse human services field and of the functions of direct and indirect human services roles; (2) develop awareness of, and sensitivity to, multiple and interacting human values in a pluralistic society; (3) develop human interaction and leadership skills; (4) intervene effectively in a helping role; (5) enter or advance in human services occupations; and (6) prepare for graduate study in a professional field.

The program includes a variety of courses and fieldwork experiences. Opportunities are provided for acquaintance with diverse human service settings and professionals in the field, and for academic concentration in selected departments of George Washington University.

Programs for students are individually planned after an evaluation is made of previous professional and educational experiences and long-range goals. Advanced standing may be awarded for liberal arts and specialized courses completed at accredited colleges and universities. In addition, advanced standing is granted for registered nurses who have completed two- or three-year programs at accredited teaching institutions—up to 30 semester hours for two-year programs and 45 semester hours for three-year programs. For nurses, credit is recognized for courses completed in the sciences but not in the humanities or social sciences.

Students are required to complete the following requirements for the degree, either in previous work at another accredited institution of higher education or at George Washington University. The final 30 semester hours must be completed at George Washington University.

Core Courses:	Educ 50, 71, 72, 104, 105, 124; SLP 152; and 15 additional semester hours in the core program selected with advisor's approval	39
Concentrations:	Concentrations are selected in the following fields: administration, early childhood education, rehabilitation, special education, therapeutic recreation, adult education, health services administration, and human resource development	24
English:	Engl 9 or 10 and 13	6
Humanities:	Hum 1	3
Statistics:	Selected with advisor's approval	3
Science:	BiSc 3–4	6
Speech and Drama:	SpDr 11, 121	6
Social Sciences:	Courses selected with advisor's approval: 6 hours of history or political science; 9 hours each of anthropology and sociology; 6 additional hours including a course in professional ethics	30
Electives:		9
	Total	126

GRADUATE STUDY

The School of Education and Human Development offers graduate programs leading to the degrees of Master of Arts in Teaching, Master of Arts in Education and Human Development, Education Specialist, and Doctor of Education.

GRADES

For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal; *CR*, Credit. Grades *A*, *B*, *C*, and *F* are counted in computing the quality-point index (see page 47).

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. An instructor recording a grade of *I* will normally stipulate a date by which work must be completed. The instructor has the responsibility for changing the grade of *I* to an appropriate grade upon completion of work, or, if work is not completed by the stipulated date, determining whether the grade of *I* should be changed to *F* or allowed to remain in the record.

THE DEGREE OF MASTER OF ARTS IN TEACHING IN THE FIELD OF MUSEUM EDUCATION

The School of Education and Human Development offers an intensive interdisciplinary fifth year in museum education. The program is designed to prepare selected liberal arts graduates, postgraduates, and professionals for work in museum settings, nature centers, and historic sites, or for liaison between museums and school systems.

Admission

To be admitted to the program in museum education an applicant must (1) have a bachelor's degree from an accredited institution; (2) submit three written references attesting to quality of academic record and work experience; and (3) be interviewed by the Selection Committee or make alternative arrangements specified by the Committee. Considered essential are skills in communication, a desire to study and learn from the artifacts of nature and civilization, and an ability to work with people. Evidence of strong undergraduate, graduate, or professional experience in such fields as American studies, anthropology, art history, fine arts, or the physical sciences is desirable.

Plan of Study

The program begins with a six-week summer session. Emphasis is on the study of museums and communication skills. During the fall semester students study the school as an institution—its organization, pupil population, staff, and services—and as a laboratory where they will work in classrooms with students and teachers. The program also focuses on other museum audiences. During the spring semester the student holds an

internship in an area museum of science, art, or history. In addition, students earn 12 semester hours of credit in a museum-related discipline. For details write the Director, Museum Education Program, George Washington University, 2201 G Street, N.W., Washington, D.C. 20052.

THE DEGREE OF MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

Programs of study leading to the degree of Master of Arts in Education and Human Development are designed to enable prospective teachers and experienced teachers to increase their professional and academic knowledge and skills and to prepare for special types of educational service. They also provide opportunities for college graduates in other disciplines to acquire needed professional education, as well as study in the subjects which are directly related to their professional objectives.

Master's programs are available in the fields listed on the following pages.

Adaptive Physical Education

The primary goal of the adaptive physical education degree program is to make a contribution toward alleviating the shortage of trained personnel in physical education for handicapped persons. The program also serves to retrain physical educators for new roles in public school systems and developmental and rehabilitation settings. The program focuses upon the adaptive physical educator as part of the comprehensive treatment team; therefore a multidisciplinary approach is emphasized.

Adult Education

The program of study in the field of adult education prepares students for positions in educational institutions, voluntary organizations, and other institutions in the private or public sectors which sponsor adult learning programs. The students enrolled in this program obtain the skills and understandings required to perform functions associated with the roles of learning specialist, administrator, counselor, and consultant in the field of adult education.

Administration of College Student Development Services

The master's degree program in administration of college student development services provides the academic, professional, and philosophical preparation for entry-level positions in the field of student affairs. The program provides education in administration, counseling, group facilitation, leadership training, and organizational development. Many graduates are employed in colleges and universities in the areas of career development, international student advising, residence hall programming, financial aid, student affairs research, student activities, admissions, and counseling.

Community Counseling

The community counseling program prepares individuals to do vocational, educational, or personal counseling in community or governmental agencies.

Curriculum

The master's degree program in curriculum has been developed to assist educators in meeting state licensing requirements for school administration and supervision. Courses cover a broad range of theory and practice and are appropriate for non-school-based agencies and for educators concerned with program or learning media development.

Dance

The master's degree program in dance is designed to prepare dance specialists for roles in the areas of choreography, therapeutic dance, dance education, performance, or for specific areas of specialization, i.e. criticism, history, research. The student plans with the advisor a course of study that considers individual background, professional interests, and career goals. Students from a variety of disciplines are accepted into the degree program.

Early Childhood Education

The master's degree program in early childhood education prepares teachers, directors, and supervisors in nursery schools, day care centers, and kindergartens, as well as researchers and program specialists in the field.

Education and National Development

This program of studies helps develop individual skills and competencies for organizational leadership or leadership support in our rapidly changing society. It provides a core of professional course work, along with competency-based electives, seminars, and internships in federal, state, and local agencies. The program is intended for active and developing leaders in education and related fields in government, institutions, organizations, business, or industry who desire to understand and operate effectively in policy development or policy development support areas.

Elementary Education

The master's degree program in elementary education is planned to help teachers continue their professional growth and advance in competence in their work in regular elementary school classrooms. The program may be used to develop an academic specialization for work with elementary school children, or to explore fields of specialization for present or future professional goals.

Elementary/Secondary Administration

The graduate program in educational administration is designed to prepare students for leadership roles in public and private educational organizations. The master's degree program in elementary and secondary administration is considered to provide the minimum entry-level preparation for the positions of principal, assistant principal, and head of department.

Exercise Science

This program is designed to prepare the student to assess physical fitness,

prescribe therapeutic activities, conduct exercise programs, and evaluate program effectiveness. Placement opportunities for graduates include occupational health and fitness programs, health spas and clubs, government agencies, and business and industrial programs.

General Physical Education

This program permits students to take courses in allied areas and cognate fields to enhance their ability to compete for more varied employment opportunities in general physical education. The electives are planned by the student in consultation with the advisor and are based on background and professional goals.

Gifted and Talented

This program is planned to help students to prepare themselves in a comprehensive and research-based manner to teach gifted and talented individuals; to design programs and prepare appropriate instructional strategies and materials for the gifted and talented; and to supervise or administer programs for the gifted and talented. Graduates will be prepared to work with gifted and talented individuals at a self-selected level, ranging from early childhood through adulthood.

Higher Education

The higher education program affords the student a concentration in administration, teaching, or curriculum. Courses prepare students for administrative positions in areas generally encompassing college and university organizations: academic affairs, public relations, finance, and development.

Human Resource Development

The program of study in the field of human resource development is designed for persons either entering or advancing in positions associated with training, education, and development activities in business, industry, government, and other large organizations in the public or private sectors. The program prepares students with the skills and understandings needed for responsibilities as learning specialists, administrators, and consultants in this field.

Individualized Master of Arts

This program permits development of individualized programs which cut across existing fields, both within the School of Education and Human Development and between Education and other schools and departments of the University and Consortium. The program is designed to meet specific professional objectives of applicants with unique needs. It will be possible to relate independent study, special workshops, international experiences, and a thesis to identified objectives. There must be a balance between foundational and specialty preparation and between theoretical and practical experiences.

International Education and Human Resource Development

This program is designed for persons either entering or advancing in positions associated with training, education, and development activities

in business, industry, government, and other organizations that require international understanding. Program content is based on the learning systems of other peoples and cultures as each reflects values, mores, customs, and current problems, thus helping the student develop a global frame of reference.

Perceptual-Motor Development

The purpose of this program is to assist the student in developing the ability to observe performance, analyze tasks, assess developmental level, prescribe appropriate activities, and apply appropriate learning strategies. Graduates are now working as motor development specialists and team members in special education settings, resource personnel for mainstreaming, curriculum specialists in movement education and perceptual-motor development, and activity coordinators in public and private day care centers.

Program Evaluation

This interdisciplinary program prepares individuals for careers as program evaluation professionals. Work settings include such fields as education and training, public health, criminal justice, employment, and welfare and human services. Opportunities exist in the federal and state governments, non-profit institutions, and other public and private agencies conducting evaluations of social and human services programs.

Reading Progress Management: Classroom and Clinic

Teachers who have completed this program have been employed in various school systems, as special reading teachers, reading clinicians, reading consultants, or reading supervisors. Persons who complete the program (or courses selected from it) will be more attractive candidates for regular classroom teaching positions, in addition to being more effective teachers.

Rehabilitation Counseling

This program prepares individuals to provide counseling and psychosocial services to people with physical, emotional, intellectual, or social disabilities. Employment opportunities exist in state rehabilitation agencies, sheltered workshops, rehabilitation centers, mental health settings, industry, and other settings in the private sector.

School Counseling

The school counseling program prepares individuals to be certified to work as counselors in elementary or secondary schools.

Secondary Education

This program is designed primarily for junior and senior high school teachers who wish to further develop their skills and competencies in teaching. The program is also useful to those interested in learning about secondary schooling in the United States.

Special Education

Early Childhood Special Education

The early childhood special education program consists of 39 semester

hours of graduate credit designed to bring students insight and knowledge in the areas of the development of young exceptional children; handicapping conditions of early childhood; identification and assessment procedures in early childhood special education; clinical teaching of developmentally disabled young children; and alternative models of service to the developmentally disabled young child. This two-pronged program prepares teachers of developmentally disabled young children (a direct service role), and early childhood special education strategists (a consultant role). Admission requirements differ for each role. Eligibility for this program is best determined by a personal interview with the program staff.

Liaison Special Educator/Parent Educator

This is a non-teaching special education program preparing professionals with the expertise to provide leadership and liaison services in the integration of special education, health, and social services for the handicapped child and his or her family.

Psychoeducators of the Seriously Emotionally Disturbed Adolescent

This is a multidisciplinary program blending course work and clinical experiences for preparing special educators who serve the severely disturbed adolescent within the multidisciplinary interagency team context. With the majority of training provided within the Special Education Department, graduate students are also involved in course work and/or clinical experiences with the Education, Health Services Administration, Psychiatry and Behavioral Sciences, Psychology, Sociology, and Speech and Drama Departments.

Special Educators for Adjudicated Youth

This interdisciplinary program is designed to prepare special educators of adjudicated youth to work in local, state, or federal facilities that serve incarcerated youth (age 18 and under), with emphasis on the special education needs of this population. Graduates of the program will be prepared to provide diagnostic and prescriptive services, educational programming for handicapped youth in juvenile justice facilities, and liaison/coordination of facility services with community-based programs.

Vocational/Special Education

This program is designed to provide trained personnel to assist the handicapped to become self-sufficient in an increasingly complex society. The emphasis of the program has been placed on career training in order to assist the handicapped person to obtain a constructive place in the working community. The student receives intensive training in assessment, individual educational planning, pre-vocational education, supportive-vocational education, academic programs, and community placement. A graduate of this program will be prepared to be either a *classroom-based* teacher in a secondary-level school, serving as a work-study coordinator or special education classroom teacher, or a *school-based* resource teacher.

Supervision and Human Relations

The program in supervision and human relations prepares persons for administrative and supervisory positions in public and private schools and

school districts. The program is designed to lead toward licensing for administrative and supervisory positions in nearby states. Basic courses relate to general supervisory principles and responsibilities, and will also be of interest to educators in non-school agencies.

Therapeutic Recreation

The program prepares students for positions in therapeutic recreation in hospitals, institutions, day care centers, geriatric facilities, community recreation departments, and other facilities which provide services to special populations. At least seven roles have been identified in the field of therapeutic recreation: these include therapist, counselor, educator, supervisor, administrator, researcher, and consultant.

Tourism Development and Travel Administration

The program has an emphasis that is international in scope; it is concerned with public travel and tourism offices, convention and visitor bureaus, research and planning firms, financial institutions, tour wholesalers, travel agencies, educational institutions, and corporations involved in travel and tourism. The program is intended for those concerned with developing competencies needed for advancement in tourism and travel organizations, and with preparing entry-level professionals for placement. Graduates are now employed by travel-related businesses, colleges and universities, national tourism agencies, resorts, and in other travel/tourism organizations.

ENTRANCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

A bachelor's degree from an accredited institution and an undergraduate quality-point index of 2.50 or above (C+ average) are required. Students whose quality-point index is in the range of 2.3 to 2.49 will be considered for provisional admission. The quality-point index is computed on the basis of the last two years of the bachelor's degree program and on all course work completed beyond the baccalaureate.

Two years of successful teaching are required before admission to candidacy in the field of elementary/secondary administration. Experience may be required for admission to programs in adult education and human resource development.

Appropriate prerequisites may be required by each master's degree major field program.

An interview in the office of the dean is required for applicants who live in the Washington, D.C., metropolitan area; a letter of reference is required of all other applicants.

ADVANCED STANDING

Advanced standing is granted for approved courses taken at other accredited institutions, but a minimum of 24 semester hours must be completed at this University as a master's candidate.

A maximum of 12 semester hours of advanced courses completed in this University in excess of the requirements for the bachelor's degree may be credited toward the master's degree if the work fits in with the student's plan of specialization.

Advanced standing is not granted for work completed five or more years before application for admission or readmission to master's candidacy.

PLAN OF STUDY

The plan of study leading to the degree of Master of Arts in Education and Human Development requires a minimum of 33 hours of graduate credit. The plan may, at the student's option, include a thesis carrying six hours of graduate credit. Whether or not a student selects the thesis option, a minimum of 18 hours must be from courses planned primarily for graduate students (third-group courses). A minimum of 12 hours, not including the thesis, must be from courses offered by the School of Education and Human Development.

Programs are planned initially in conference with an admission advisor in the School of Education and Human Development and subsequently with a designated advisor in the candidate's area of specialization. Programs are based on a candidates' interests and background; those related to teaching in public schools are designed around certification requirements of the state and locality in which the candidate plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete satisfactorily 24 semester hours in residence. Students interested in completing a second master's degree program in the School of Education and Human Development may do so by completing all core and specialization requirements and a minimum residency requirement of 24 semester hours.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive the grade of *C* in more than six semester hours are subject to suspension. Students who receive a grade of *F* must confer with the dean before enrollment for further work.

THE THESIS

The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School of Education and Human Development standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends beyond the additional time granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER'S COMPREHENSIVE EXAMINATION

Candidates in master's programs requiring 33 semester hours may, with the approval of their academic advisors, elect to take an additional three-semester-hour course in lieu of a comprehensive examination. Candidates

in programs whose basic requirements exceed 36 semester hours may waive the comprehensive examination with approval of the academic advisor. Candidates who plan to take the examination must be registered in the semester it is to be taken and must file a written application in the office of the School of Education and Human Development no later than 30 days prior to the date of the examination. Comprehensive examinations are required of students in Early Childhood Education, the Administration of College Student Development Services, Gifted and Talented, Reading Progress Management: Classroom and Clinic, all programs in Human Kinetics and Leisure Studies, and all programs in Special Education.

WORK IN OTHER ACADEMIC DEPARTMENTS

For teachers interested in developing or strengthening their academic competence, the master's programs in elementary and secondary education normally permit 15 to 18 semester hours of work in departments other than education. These programs are designed to meet the need of teachers-in-service who need additional work in content to qualify for advanced certification or to improve their classroom skills and may also be helpful to previously trained teachers planning to re-enter the profession. The major emphasis is upon strengthening both academic and professional competencies.

SECOND MASTER'S DEGREE

Persons seeking a second master's degree in the School of Education and Human Development must complete all core and specialization requirements and a minimum residency requirement of 24 semester hours.

THE DEGREE OF EDUCATION SPECIALIST

The program of advanced study leading to the degree of Education Specialist is for students with master's degrees in education who seek further professional preparation for specific objectives.

Education Specialist programs are available in the fields of administration, adult education, counseling, curriculum, higher education, human resource development, and special education.

Entrance Requirements

The degree of Master of Arts in Education and Human Development, or equivalent; two years of pertinent experience in education; a graduate scholastic average of at least 3.3 or a 50th percentile score on the Graduate Record Examination or Miller Analogies Test are required. A score on one of the specified tests must be submitted as part of the admission procedures.

Each applicant must be interviewed and recommended by a faculty advisor in the major field who will submit a tentative program plan prior to admission.

Scholarship

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education and Human Development (see above).

Programs of Study and Degree Requirements

Individual programs are developed, through the faculty-advisor plan, to fit the candidate's skills, interests, and career goals. A minimum of 30 semester hours beyond the requirements of the degree of Master of Arts in Education is required. At least 21 hours of this work must be taken on campus at this University; with the approval of the advisor, the remaining semester hours of the program may be taken in off-campus offerings of the GWU Division of Continuing Education and Summer Sessions or at another approved university. A maximum of five calendar years is allowed for completion of the program.

At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, (3) an area of specialization.

The Comprehensive Examination

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

THE DEGREE OF DOCTOR OF EDUCATION

The School of Education and Human Development offers programs of advanced study leading to the degree of Doctor of Education. These programs, which are under the supervision of the Advanced Graduate Faculty, provide major fields of study in teacher education, special education, counseling, administration and curriculum, adult education, human development, human resource development, and higher education. Supporting fields are available in administration, administration of higher education, adult education, college student development, counseling, curriculum, elementary education, higher education, human development, human resource development, international education, program evaluation, reading, secondary education, special education, supervision, teacher education, and tourism development and travel administration. With the approval of the Advanced Graduate Faculty and the departments concerned, one supporting field may be taken in other departments of the University. All programs require study of interrelated areas of education and a doctoral dissertation in the major field of study.

Admission

The applicant must have adequate preparation for advanced study, including graduate work in fields prerequisite to his or her objective, equivalent to that required for the degree of Master of Arts in Education at this University, at least three years of successful pertinent educational experience, acceptable personal qualities, and a capacity for creative scholarship and effective leadership.

The applicant first arranges for an interview with the assistant dean to explore the applicant's needs in relation to the resources of the School and to guide the student in applying for doctoral study. The required procedures and standards will be explained at this time. Candidates meeting the initial standards are admitted to precandidacy for the degree.

PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of course work in the program, including requirements specified by the Advanced Graduate Faculty, must be completed. This work must be completed within three semesters of admission to precandidacy, for part-time students, or within the first 18 semester hours of course work for full-time students. Application for full candidacy will then be decided on the basis of the quality of scholarship in the precandidacy period, the recommendations of instructors, a detailed plan for the balance of the program, and a qualifying examination.

Plan of Study

In general, from two to three years of full-time study beyond the degree of Master of Arts in Education, or the equivalent in part-time study, are required. Programs are individually planned. It is estimated that, for the average student, the work required for the total program will be 75 semester hours, including a minimum of 12 semester hours of dissertation research.

Each program is divided into two parts. The first consists of preparation for comprehensive examinations in a major field of study and two supporting fields, and completion of a required research tool field. The second is composed of research investigation, the writing of a dissertation, and the final oral examination.

Students who have completed the comprehensive examinations must register for a minimum of six semester hours of *Dissertation Research* (Educ 491) per semester until 12 hours have been completed, and a minimum of three semester hours a semester thereafter, up to a total of 24 semester hours, until the satisfactory completion of the final examination.

COMPREHENSIVE EXAMINATIONS

Upon admission to doctoral candidacy the student is assigned to a committee, each member of which is responsible for guiding the preparation for one of the required comprehensive examinations in supporting fields or the major field comprehensive examination. The candidate must arrange individual conferences with the committee members to determine the content of each field and to receive guidance in preparation for the examination.

The supporting field examinations, which are taken first, are three-hour written examinations. In addition to the research tool field a student who plans a historical research investigation for the dissertation may be required to complete an appropriate research seminar offered by the Department of History. The tool requirement must be completed prior to the major field examination. The major field examination is a written 12-hour examination, six hours on each of two successive days.

The candidate begins the second part of the program after the satisfactory completion of all supporting field examinations, the required research tool field and the major field examination.

THE DISSERTATION

A dissertation is required as evidence of ability to perform scholarly research and to interpret and present its results.

During the first part of the program, the dean appoints a dissertation committee, consisting of a chairperson (usually a major field advisor) and two additional faculty members. The candidate is required to submit a proposal for the dissertation to this committee, which determines its acceptability. The dissertation is completed under the guidance of the chairperson, with the advice of the other members of the dissertation committee.

No later than the date specified in the calendar, the candidate must submit to the dean five complete copies of the dissertation and two copies of an abstract for inclusion in the announcement of the examination and for reproduction by University Microfilms, Inc. Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in the office of the dean. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover the expense of printing the Announcement of the Final Examination and to cover the basic service rendered by University Microfilms, Inc., and to sign a microfilm agreement.

THE FINAL EXAMINATION

When the dissertation has approval of the director, the candidate is recommended to the dean for the final oral examination, which must be passed at least three weeks before the degree is to be conferred. The examination is open to the public and is conducted by a committee of the faculty, appointed by the dean, supplemented by at least two leaders in the candidate's field of study from outside the University. Candidates who successfully pass the oral examination are recommended for the degree by the faculty of the School of Education and Human Development.

Residence and Continuous Study

All the preparation for the degree, including examinations, courses, seminars, and other work done under the direction of an advisor, must be done in residence. The student must be continuously enrolled in the School of Education and Human Development, unless the dean or the Advanced Graduate Faculty grants a leave of absence. Failure to register each semester of the academic year may result in lapse of candidacy. Subsequent readmission is subject to whatever new conditions and regulations have been established by the Advanced Graduate Faculty.

The supporting and major field examinations must be completed within five years of the date of admission, and the entire program must be completed within eight years, regardless of full-time or part-time study. All candidates must satisfy one of three options for full-time study. Information concerning these plans will be provided by the assistant dean upon request by the candidate.

SPECIAL PROGRAMS AND SERVICES

Graduate, Undergraduate, and Nondegree Training of Personnel Serving the Handicapped

The School of Education and Human Development offers various programs for the education of personnel serving the handicapped. Field-based

training experiences are arranged throughout the metropolitan area. Students are accepted at the undergraduate, master's, and doctoral levels. Regular education and special education teachers and school administrators, as well as students from other schools and colleges at the University, may elect these courses. Inquiries concerning the programs and the availability of federal awards should be directed to Dr. Rita Ives, Department of Special Education, George Washington University, Washington, D.C. 20052.

Graduate Program in Rehabilitation Counseling

This federally funded master's degree program trains rehabilitation counselors to assist those who are disabled or disadvantaged to assume a place in society. The 51-credit-hour program combines fieldwork and coursework in preparing students for employment in an expanding field that yields high humanitarian rewards. Both the profession and the program are interdisciplinary, drawing upon such related areas as guidance, medicine, psychology, social work, sociology, and special education.

Inquiries concerning the program, the availability of traineeships for full-time students and applications should be directed to Dr. Donald Linkowski, Rehabilitation Counselor Education, George Washington University, Washington, D.C. 20052.

Graduate Specialization in Therapeutic Recreation and Adaptive Physical Education

This master's degree program in the field of physical education, with a specialization in therapeutic recreation or adaptive physical education, is funded by the Bureau of Education for the Handicapped, U.S. Department of Education. Inquiries concerning the program and the availability of graduate research assistantships and internships should be directed to the Chairman, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Therapeutic Recreation Technician Certificate Program

The Department of Human Kinetics and Leisure Studies offers a certificate program in therapeutic recreation. This prototype technician program trains paraprofessional personnel to work in a variety of settings, such as community recreation, state institutions, correctional facilities, and nursing homes. The curriculum emphasizes the therapeutic recreation process and activity leadership skills. Students who complete the program will qualify for professional registration with the National Therapeutic Recreation Society. Students in the Human Services Program may participate in this program as an area of concentration in therapeutic recreation. Inquiries should be addressed to Ms. Andrea Morris, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Certification Curricula

The School of Education and Human Development provides individually planned programs for liberal arts graduates with appropriate degrees from

accredited institutions who wish to prepare for teaching. Those seeking certification, but not wishing to work for a degree, may enroll in a certification program if they meet the admission, scholarship, and personality requirements of degree candidates. The School also provides a wide range of courses of interest to teachers who wish to renew licenses.

Reading Center (See page 54)

Off-Campus Degree Programs

The School of Education and Human Development offers off-campus programs leading to the degree of Bachelor of Arts in Education and Human Development in the field of human services and special education: complementary teacher program and the Master of Arts in Education and Human Development in the fields of adult education, elementary education, higher education, human resource development, reading progress management: classroom and clinic, secondary education, special education/early childhood, vocational special education, and supervision and human relations. The degree of Education Specialist is offered in administration and higher education. The programs are coordinated through the Division of Continuing Education and Summer Sessions.

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

Dean N.M. Loeser
Associate Dean L. Gintzig
Assistant Deans J. Lobuts, Jr., P.B. Malone III

FACULTY 1982-83*

Professors E.B. Adams, F. Amling, N. Beckman, P.S. Birnbaum, G. Black, D.S. Brown, B. Burdetsky, S.R. Chitwood, K.J. Darr, M.C. Devolites, S.F. Divita, R.F. Dyer, R.B. Eastin, A. El-Ansary, R.W. Eldridge, R.F. Ericson, E.H. Forman, S.S. Fuller, M.G. Gallagher, L. Gintzig, P.D. Grub, W.E. Halal, W.C. Handorf, M.M. Harmon, J. Hilmy, J. Harvey, W.J. Keegan, F.C. Kurtz, G.P. Lauter, E.J.B. Lewis, G.L. Lippitt, N.M. Loeser, A.J. Mastro, D.C. McGrath, Jr., J.E. Ott, H.R. Page, C.M. Paik, P.N. Reeves, D.D. Roman, S.N. Sherman, R.G. Shouldice, J.B. Spain *(Visiting)*, P.B. Vaill, W.J. Winstead *(Visiting)*

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the School of Government and Business Administration.

Associate Professors W.C. Adams, W.H. Becker, J.H. Carson, B.L. Catron, J.P. Coyne, H.J. Davis, J.D. Frame, D.E. Gale, F. Ghadar, L. Graff, W. Greenberg, S. Greene, E.W. Hahn, W.W. Hardgrave, R.L. Holland, E.L. Hullander, D.J. Lenn, S.D. Lind, J. Lobuts, Jr., P.B. Malone III, J.F. McCarthy, Jr., A.E. Merget, Y.S. Park, J.M. Sachlis, R.M.F. Southby, S.J. Tolchin, L.H. Truong, S. Umpleby, C.W. Washington, E.K. Winslow, D.L. Zalkind

Assistant Professors T.M. Barnhill, N.G. Cohen, B.E. Committe, G.E. Crum, M.J. Enders, E.J. Englander, D.R. Kane, M.S. Katzman, M.L. Liebrenz, L.M. Maddox, W. Margrabe, C.P. McKelvey, K. Newcomer, P.S. Peyser, C.J. Prager *(Visiting)*, F.J. Rooney, D.R. Sheldon, C.C. Shepherd, Jr., M.L. Slagle *(Visiting)*, J.B. Thurman, G.C. Wooding

Instructors N. McDermott, J.A. Talbot, G.B. Wright

Committees*

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S. Greene, E.W. Hahn, F.C. Kurtz, S.D. Lind, Y.S. Park, S.J. Tolchin

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E.B. Adams, K.J. Darr, S.F. Divita, D.E. Gale, M.G. Gallagher, L. Gintzig, A.E. Merget

COMMITTEE ON DOCTORAL STUDIES

T.M. Barnhill, S.S. Fuller, W.W. Hardgrave, M.M. Harmon, A.J. Mastro, P.N. Reeves, S. Umpleby

COMMITTEE ON MASTER'S STUDIES

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COMMITTEE ON UNDERGRADUATE STUDIES

A.I. El-Ansary, B.E. Committe, L. Graff, C.P. McKelvey, P.B. Malone, J.Y. Ruth

INTRODUCTION

This School was organized as the School of Government in 1928. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School; in 1966 the School of Government and Business Administration was established.

Purposes

The School of Government and Business Administration is dedicated to academic excellence through the study, teaching, and research of manage-

* The Dean of the School is an ex *officio* member of all committees.

ment and policy in the public and private sectors, both within the United States and internationally.

Over a span of half a century, the School of Government and Business Administration has developed a learning community in which mature individuals can prepare themselves to assume membership and leadership roles in society. The School practices a multi-disciplinary approach with a flexibility in educational programming in the belief that such is essential to dealing with the complexities of today's organizational society. The School offers preparation of both the generalist and the specialist for professional careers, and seeks to improve the quality and character of the individual as citizen, professional, and scholar as well.

More specifically, the purposes of the School are:

1. To prepare its graduates for positions in the management of complex organizations.
2. To provide a broad and fundamental education as preparation for positions carrying management and leadership responsibilities.
3. To provide specialized educational opportunities as preparation for career positions in professional disciplines or functional areas.
4. To explore in all their forms, through education and research, the content, interactions, and interdependencies of disciplines and institutions in the public and private sectors, both nationally and internationally.
5. To make available the School's resources to business, health, government, community, and other organizations in both the metropolitan area and the larger community.
6. To foster understanding and advancement of knowledge and skills in the world community through research, education, and scholarly exchange with governments, institutions, and organizations engaged in the solution of international trade and investment problems, and the management of human settlements.

Academic Status

The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business, and the undergraduate and graduate programs in business administration are accredited by the Assembly. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planners Association. The School is a member of the National Association of Schools of Public Affairs and Administration (NASPAA), and its Master of Public Administration degree appears on the NASPAA approved school list.

Fellowships

The School of Government and Business Administration has several graduate fellowships available to its students, including the Aryamehr Research Fellowships in International Business, Health Services Adminis-

tration Fellowships, Ernst and Ernst Grant to Doctoral Candidates in Business or Economics, the National Association of Purchasing Management Fellowship, the Scottish Rite Foundation Fellowships, and the Wolcott Foundation Scholarships.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stated on pages 20-33; other University regulations, on pages 46-53.

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may be dropped from any course for undue absence.

The student is held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal from a course or from the University without academic penalty is permitted during the first five weeks after registration for the fall or spring semester. Withdrawal after this period is permitted only in unusual circumstances, and requires certification by the instructors of courses for which the student is registered that the student is doing passing work (see "Withdrawal," page 48).

Adding Courses

Courses may not be added after the first two weeks of classes in any semester.

Independent Study Plan

A student of *demonstrated capacity*, with a special interest in the subject matter of a course, may be permitted to undertake study under the personal direction of an instructor, in accordance with the rules of the appropriate department. Credit under this plan is limited to the specific course credits normally allowed when taken on a class basis.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

Students from Other Schools within the University

Degree candidates from other schools of the University cannot register for more than 12 hours of credit in courses from the Bachelor of Business Administration or Master of Business Administration degree programs.

Common Body of Knowledge

Programs leading to the degrees of Bachelor of Accountancy, Bachelor of Business Administration, Master of Accountancy, and Master of Business Administration include the equivalent of at least one year of work in the following areas:

1. a background of the concepts, processes, and institutions in the production and marketing of goods and/or services and the financing of the business enterprise or other forms of organization;
2. a background of the economic and legal environment as it pertains to profit and/or nonprofit organizations, along with ethical considerations and social and political influences as they affect such organizations;
3. a basic understanding of the concepts and applications of accounting, quantitative methods, and information systems;
4. a study of organization theory, behavior, and interpersonal communications;
5. a study of administrative processes under conditions of uncertainty, including integrating analysis and policy determination at the overall management level.

THE BACHELOR'S DEGREES

The School offers programs leading to the degrees of Bachelor of Accountancy and Bachelor of Business Administration in the fields of business economics and public policy, finance, information processing, international business, marketing, and personnel management.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class include:

1. An acceptable certificate of graduation from a U.S. secondary school, showing at least 15 units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting a U.S. secondary certificate or its foreign equivalent must also show competence in the English language by scoring not less than 550 on the first taking of the TOEFL or 600 on the second taking. International students may be required to

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

enroll in a full-time program in English before beginning studies in a degree program.

2. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test. (Normally, students with SAT verbal scores below 450 or SAT math scores below 500 will not be admitted.)

Criteria for admission include a strong high school record and a satisfactory performance on the Scholastic Aptitude Test examinations. It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08541, or 1947 Center St., Berkeley, Calif. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University, are as follows:

Ordinarily, students who have accumulated (1) no more than 30 semester hours of transferable relevant academic credit must have a minimum 2.00 cumulative grade index, as well as meeting the freshman requirements or (2) 31-90 transferable semester hours of relevant academic credit must have a 2.50 or higher cumulative grade index. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of *C* or better, and may be applied toward a degree provided they are comparable to the curricular requirements of the degree.

In no case will more than 60 semester hours of advanced standing be granted for course work completed at regionally accredited community or junior colleges. Upper-level courses taken at such colleges may be applied toward the bachelor's degrees provided they are comparable to BAd 104, Mgt 118, or Mgt 119. Other courses (one course per area up to a maximum of three courses), comparable to this School's courses numbered 101-200, taken at an accredited community or junior college with an earned grade of *C* or better, may be accepted to waive certain required courses. The waiver of a required course does not entitle the student to any semester hours of credit.

Although a grade of *D* is not acceptable for transfer of credit, the course may be used to waive a curricular requirement. Credits earned with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit. An

exception to this rule is the freshman English composition requirement and all accounting courses. Any student earning a grade lower than C in such courses at another institution may be required to repeat the courses at this University.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, Rice Hall, George Washington University, Washington, D.C. 20052.

A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions in Rice Hall.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curricular requirements of the degree. A maximum of 90 semester hours of transfer credit may be applied toward a degree program in this School.

In no case will credit for more than 15 semester hours of undergraduate course work taken at this University in nondegree status be allowed toward meeting degree requirements in the School of Government and Business Administration.

Readmission

A student who withdraws, is suspended or is otherwise absent from the University for one semester or more must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. If the student has attended one or more regionally accredited colleges or universities during absence from the University, complete official transcripts must be sent to the Office of Admissions from each institution attended.

The application fee is waived for a student applying for readmission who was registered as a degree candidate at the time of last registration at the University and who has not since registered at another college or university.

DEGREE REQUIREMENTS

Academic Work Load

A full-time student not on probation may not ordinarily take more than 15 semester hours. A student employed more than 20 hours a week, who is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or higher may take up to 18 semester hours. A student employed more than 20 hours a week, whose index is 3.50 or higher, may take up to 12 semester hours.

A student who accepts employment after registration or at any time during a semester must report immediately to the Dean, so that the program may be adjusted if necessary.

Exception to these rules will require the approval of the Dean.

An undergraduate student on probation may take no more than 12 semester hours of course work.

Scholarship Requirements

A student must have the following to graduate: (1) an overall quality-point index of at least 2.00 and (2) a quality-point index in the major field of instruction of at least 2.00. All courses which are acceptable for credit toward the bachelor's degrees are to be included in the *overall quality-point index* calculation. Elective courses in or out of the School of Government and Business Administration cannot be used as substitutes for required courses in the calculation of the *major quality-point index*. Only 100-level courses are used in the *major quality-point index* calculation.

DEAN'S HONOR LIST

The names of students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours (provided that the 12 hours are taken for a grade) and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 47.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

PROBATION

A student whose quality-point index (either overall or in the major) falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts another 12 semester hours of work, which may include remedial studies as prescribed.

SUSPENSION

A student whose quality-point index (either overall or in the major) is 1.50 or below, or whose index remains below 2.00 at the end of the probationary period, will be suspended. A student suspended for poor scholarship may apply for readmission after the lapse of either a fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence of conduct during absence from the University which indicates that the student will profit from readmission. A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 on each 12 semester hours of work undertaken until the cumulative (or major) index is 2.00. In no case will

the probationary period after readmission exceed 24 hours of study. A student suspended twice for poor scholarship will not be readmitted.

PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the quality-point index. No student will be allowed to take more than four pass/no pass courses. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Required courses may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment in the University.

Residence

A minimum of 30 semester hours, including at least 12 semester hours in the major field of instruction, must be completed while registered in the School of Government and Business Administration. This requirement applies to students transferring within the University, as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Government and Business Administration.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree in the School of Government and Business Administration.

Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours or waive curricular requirements by performing satisfactorily on the following tests:

College-Level Examination Program (CLEP)—See pages 22-23 for general information on the CLEP tests. CLEP tests in Introduction to Business, Commercial Law, and Data Processing are limited to three credits each of advanced standing. CLEP tests in college algebra/trigonometry, English composition, and more advanced courses in accounting and business administration are not accepted for advanced standing. Students enrolled in George Washington University who wish to receive credit for CLEP Subject Examinations must receive prior approval of the department.

Advanced Placement Tests—See page 22.

Achievement Tests—See page 24.

Examinations for Waiving Curriculum Requirements—The School of Government and Business Administration does not administer waiver examinations. However, certain arts and sciences courses may be waived,

and in some instances credit may be assigned, by satisfactorily passing a special departmental examination authorized and prescribed by the department or curricular advisor concerned. Requests to take the examination should be made to the curricular advisor and the required fee paid at the Office of the Cashier before the date set for the examination. See page 77 for more information.

Cooperative Education Program

The School of Government and Business Administration has entered into several Cooperative Education agreements with U.S. government agencies in the Washington, D.C., area. Students who are selected to participate in these programs generally work in paid employment for one semester and attend school the next semester. Since these programs are currently designed for juniors or seniors or equivalent, program length is for one- or two-year periods. The areas of work are closely integrated to the student's major field of instruction, i.e., marketing, finance, personnel, etc. Interested students should contact the Chairman, Department of Business Administration, for specific guidance and details.

THE BACHELOR OF ACCOUNTANCY

The principal objective of the undergraduate program in accounting is preparation for a professional career in accounting. Although professional preparation requires specialization in the acquisition of accounting knowledge in the junior and senior years, attainment of the objectives requires a general education in English, humanities, social sciences, mathematics, and sciences in the first two years of undergraduate study. In addition, a common body of knowledge in business administration is necessary during the junior and senior years, with special reference to the needs of the student in the accounting program. An additional objective is the preparation of students for a fifth-year or Master of Accountancy program that is intended to meet the academic needs of students seeking professional accounting careers in the public or private sector which currently demand high entry-level academic achievement.

One hundred and twenty semester hours are required for graduation. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and the course prerequisites.

Curriculum for the Pre-Accountancy Program*

FRESHMAN YEAR

		Semester Hours
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11	6
Mathematics:	Math 31–32 or 51–52	6
Science:	BiSc 3–4; Chem 3–4; Geog 1, 2; Geol 1–2; or Phys 9–10	8

* To be accepted in the Bachelor of Accountancy program a cumulative grade average of 2.50 or higher is required at the start of the junior year.

		Semester Hours
Social Sciences:	PSc 2; Soc 1	6
	Total	30

SOPHOMORE YEAR

Accounting:	Acct 51–52	6
English:	Engl 100	3
Social Sciences:	Psyc 1 and 8; Phil 45 or 50 and 131	12
Statistics:	Stat 51	3
Speech:	SpDr 111	3
Computer Studies:	Mgt 118	3
	Total	30

Curriculum for the Accountancy Program

JUNIOR YEAR

Acct 101:	Cost and Budgetary Control	3
Acct 121:	Intermediate Accounting	3
Acct 151:	Business Law for Accountants I	3
Acct 161:	Federal Income Taxation: Individuals	3
Acct 191:	Advanced Accounting	3
BAd 120:	Business Finance	3
BAd 140:	Basic Marketing Management	3
BAd 191:	Fundamentals of Management	3
Econ 121:	Money and Banking	3
Stat 103:	Sampling in Accounting	3
	Total	30

SENIOR YEAR

Acct 132:	Accounting Theory	3
Acct 152:	Business Law for Accountants II *or*	
Acct 162:	Federal Income Taxation of Corporations	3
Acct 171:	Auditing	3
Acct 181:	Accounting Systems	3
BAd 101:	The Business Environment	3
BAd 110:	Personnel Management *or*	
Mgt 107:	Fundamentals of Behavioral Science	3
BAd 160:	Introduction to International Business *or*	
BAd 166:	International Marketing Management *or*	
BAd 171:	International Business Finance	3
BAd 193:	Managing Production/Operations	3
BAd 198:	Business Policy and Administration	3
Elective:	Chosen from Columbian College or the School of Government and Business Administration. Qualified students accepted in the Accounting Internship Program will elect Acct 199	3
	Total	30

ACCOUNTING PRACTICE INTERNSHIP

An internship program, limited to selected senior accounting majors, is available during the semester break of the senior year. To be admitted

to this program students must have the approval of the chairman of the Department of Accounting and must have completed at least 15 semester hours of accounting courses, including a course in auditing, by the end of the fall semester of the senior year, with a grade average of 3.0 both in accounting and overall at the start of the fall semester of the senior year. Students will be paid a salary while conducting audits under senior supervision of participating C.P.A. firms. Students who complete the internship successfully will register for Acct 199 the spring semester of their senior year and will receive three semester hours of credit. For further information consult the chairman of the Department of Accounting.

THE BACHELOR OF BUSINESS ADMINISTRATION

One hundred and twenty semester hours of course work are required for graduation. To be recommended by the Faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work, a minimum of 60 semester hours (second-group course work) in the junior and senior years selected from one of the six major fields of instruction offered by the School. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and the course prerequisites. The major field of instruction must be selected at the end of the sophomore year.

Math 3, 6, 9, and 10 may not be used for credit towards the B.B.A. degree. First-year foreign language courses may be used as freshman electives provided that the student has not previously studied the language at the secondary level.

Curriculum for the First Two Years for All Bachelor of Business Administration Students

FRESHMAN YEAR

		Semester Hours
Mathematics:	Math 31–32 or 51–52	6
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11	6
Science:	BiSc 3–4; Chem 3–4; Geog 1, 2; Geol 1–2; or Phys 9–10	6
Elective:	Courses other than accounting, business administration or economics*	6
	Total	30

SOPHOMORE YEAR

Accounting:	Acct 51–52	6
Business Administration:	BAd 51	3
Humanities:	Art 31–32 or 71–72; Chin 3–4; Engl 51–52, 71–72, or 191–92; Fren 3–4 or 6, or 51–52; Germ 3–4 or 51–52; Ital 3–4; Mus 3, 4; Phil 45, 50, or 71; Rel 9–10, 21, 22,	

* Restricted to lower than 100-level courses. (Courses in human kinetics and leisure studies may not be taken for credit.)

		Semester Hours
	23, 59, 60; Slav 3–4, 5–6, or 91–92; Span 3–4 or 6, or 51–52; or SpDr 1, 11	6
Social Sciences:	Psyc 1, 8	6
	AmCv 71–72; Anth 1–2; Hist 39–40 or 71–72; PSc 1, 2; or Soc 1, 2	6
Statistics:	Stat 51	3
	Total	30

Majors in Business Economics and Public Policy, Finance, Information Processing, International Business, Marketing, and Personnel Management

The programs in these six fields of instruction are designed to provide the broad foundation required for eventual leadership in either business or governmental administration. The programs consist of 36 semester hours of required general business administration courses; 15 hours of required major-related courses; and nine hours of electives, normally advanced courses in liberal arts subjects.

JUNIOR YEAR

Acct 193:	Business Budgeting	3
BAd 110:	Personnel Management	3
BAd 120:	Business Finance	3
BAd 140:	Basic Marketing Management	3
BAd 191:	Fundamentals of Management	3
Mgt 118:	Introduction to Information Processing	3
Major-Related Courses:	Six semester hours selected from the chosen area of specialization (see below)	6
Elective:	To be selected in consultation with the advisor	6
	Total	30

SENIOR YEAR

BAd 101:	The Business Environment	3
BAd 104:	Commercial Law	3
BAd 193:	Managing Production Operations	3
BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
*Psyc 144:	Personnel and Industrial Psychology or	
Mgt 107:	Fundamentals of Behavioral Science	3
Major-Related Courses:	Nine semester hours selected from the chosen area of specialization	9
Elective:	To be selected in consultation with the advisor	3
	Total	30

The major field should be selected at the end of the sophomore year. The student should contact the Assistant Dean for Undergraduate Programs for the assignment of a faculty advisor. Major-related courses for busi-

* Marketing majors should complete BAd 142, *Consumer Behavior*, in lieu of this requirement.

ness economics and public policy, finance, information processing, international business, marketing, and personnel management are described below.

1. Business Economics and Public Policy

This field is directed toward developing understanding and skills applicable to a wide variety of positions in business and government. Students will supplement basic course work in business and economics with additional courses in economics, political science, and government-business relations. The social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of governmental programs and regulatory activity will be studied to establish a basis for developing and evaluating effective business responses. The program is concerned with the continuing business-government dialogue on effective and equitable relations between the two sectors of the economy.

The following courses provide a basic academic foundation in the area of business economics and public policy:

BAd 117:	Collective Bargaining
BAd 171:	International Business Finance
*Econ 101:	Intermediate Microeconomic Theory
*Econ 102:	Intermediate Macroeconomic Theory
Econ 136:	Natural Resources and Environmental Economics
Econ 156:	Industrial Organization
Econ 159:	Government Regulation of the Economy
Econ 161:	Public Finance I
Econ 162:	Public Finance II
Econ 181–82:	International Economics
PSc 116:	The American Presidency
PSc 117:	Public Administration and Bureaucratic Politics
PSc 118:	Legislative Process

2. Finance

This field helps students develop the skills required for entry-level employment in corporations, financial institutions, and the public sector. Corporations employ entry-level finance specialists for cash, credit, or inventory analysis or management and for work in bank relations and capital budgeting. Financial institutions offer opportunities for entry-level finance specialists to analyze specific securities and to assist in loan analysis. The government sector looks to finance majors as potential financial analysts. The undergraduate B.B.A. degree with a finance major also provides an excellent foundation for graduate academic programs, especially the study of law.

The following courses provide a basic academic foundation in the field of finance:

Acct 111:	Financial Statement Analysis *or*
Acct 121:	Intermediate Accounting
*BAd 123:	Investment and Portfolio Management
*BAd 124:	Advanced Financial Management
BAd 130:	Working Capital Management
BAd 132:	Real Estate Investment *or*
BAd 133:	Fundamentals of Insurance and Risk Management
BAd 135:	Capital Formation
BAd 171:	International Business Finance

* Required for this major field.

3. Information Processing

Students taking this field are recruited by organizations in both the public and private sectors for positions as programmer/analysts and systems designers. These entry-level positions lead to careers in the marketing of computer hardware and software, systems consulting, and management. Medium to large organizations are currently expanding their reliance on computer systems and, with the development of inexpensive but powerful mini- and microcomputers, thousands of smaller organizations are finding computers to be cost-effective as well.

Students will supplement the basic skills learned in the B.B.A. curriculum with courses planned to provide a firm foundation in the use of the computer as a tool in solving information problems in organizations. These courses relate ongoing, real-world applications of computers to the functional areas of business and government organizations.

The following courses provide a basic academic foundation in the area of information processing:

†CSci 157: Machine and Assembly Language Programming
†CSci 158: Algorithmic Methods and High-Level Languages
*Mgt 119: Computer Programming for Information Systems
*Mgt 120: Information Systems Development I
*Mgt 121: Information Systems Development II
*Mgt 122: Special Studies in Information Systems
Phil 121: Symbolic Logic
Stat 114: Data Structures

4. International Business

This field provides the basic academic foundations for entry-level positions in international business, particularly in multinational corporations, international banks, and government agencies. Such organizations include the Departments of Commerce, State, and Treasury, plus international institutions such as the Export-Import Bank, World Bank, and Overseas Private Investment Corporation. Students in this option are encouraged to include two years of a modern foreign language in their preparatory background.

The following courses provide a basic academic foundation in the area of international business:

BAd 148: Advertising
*BAd 160: Introduction to International Business
*BAd 166: International Marketing Management
BAd 168: Foreign Market Analysis
*BAd 171: International Business Finance
BAd 173: International Banking
BAd 175: International Monetary and Financial Issues
Econ 181–82: International Economics
HKLS 104: Introduction to Travel and Tourism

5. Marketing

This field has the objectives of: (1) developing a conceptual understanding of a complex and changing environment and its effects on marketing activities and institutions; (2) understanding the dynamics of buyer behavior; (3) providing the skills to analyze demand, market segments, and cost-volume profit relationships of marketing programs; (4) enhancing abilities in written and verbal

* Required for this major field.
† See the School of Engineering and Applied Science *Bulletin*.

communications; and (5) developing skills in formulating and implementing comprehensive marketing plans.

Typical entry-level positions for students with marketing majors are: advertising account executives, marketing research project managers, retail assistant buyers, and sales representatives for consumer or industrial products firms. Students with marketing backgrounds also have obtained positions in physical distribution, public relations, wholesale firms, and a variety of governmental and non-profit organizations.

The following courses provide a basic academic foundation in the area of marketing:†

*BAd 143:	Marketing Research
BAd 148:	Advertising
*BAd 150:	Sales Management
BAd 152:	Seminar: Retailing Management
BAd 154:	Transportation and Logistics Management
*BAd 159:	Marketing: Strategic Planning
BAd 160:	Introduction to International Business
BAd 166:	International Marketing Management
Jour 145:	Principles and Problems of Public Relations
Stat 105:	Statistics in the Behavioral Sciences
Mgt 119:	Computer Programming for Information Systems

6. Personnel Management

This field is concerned with all aspects of the employment of human resources in business organizations. Entry-level career opportunities are in such fields as personnel management, employee relations, collective bargaining, and manpower utilization. Since the field focuses on the management of human resources in a general sense, this concentration also prepares the student for responsibilities associated with general management and leadership.

The following courses provide a basic academic foundation in the area of personnel management:

*BAd 115:	Leadership in Personnel Management
*BAd 117:	Collective Bargaining
Jour 145:	Principles and Problems of Public Relations
Psyc 120:	Theories of Personality
Psyc 131:	Psychological Tests
SpDr 121:	Group Discussion and Conference Leadership

THE MASTER'S DEGREES

ENTRANCE REQUIREMENTS

To be considered for admission, applicants must present a bachelor's degree from a regionally accredited college or university. Application is made directly through the Admissions Office, School of Government and Business Administration. Admission to master's programs is granted on a highly competitive basis. Previous academic history, performance on the applicable entrance examination, letters of reference, motivation and aptitude to do graduate-level work, and professional experience are all taken into consideration.

* Required for this major field.

† BAd 142 cannot be used as a field of instruction course.

Applicants for admission to programs leading to the degrees of Master of Accountancy and Master of Business Administration must submit acceptable scores on the Graduate Management Admission Test; applicants for admission to programs leading to the degrees of Master of Health Services Administration and Master of Urban and Regional Planning must submit scores on the Graduate Management Admission Test, the Miller Analogies Test, or the Graduate Record Examination; applicants for admission to programs leading to the degrees of Master of Public Administration and Master of Science in Information Systems Technology must submit scores on the Graduate Record Examination. It is the responsibility of the applicant to make arrangements for the required test with the Educational Testing Service, Princeton, N.J. 08541. Correspondence concerning the Graduate Management Admission Test should be addressed to Box 966; concerning the Graduate Record Examination, to Box 955. Test scores that are more than five years old are not accepted for admissions review.

GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of semester hours of graduate course work. A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the School of Government and Business Administration from the Division of Continuing Education and Summer Sessions, another degree-granting division of this University, or another regionally accredited college or university under the following conditions: the course work must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be at the graduate level, it must have been taken within the past two years, and the student must have received a grade of *B* or better. This action must be approved by a petition to the designated faculty advisor and the dean. A transcript and description of the course work must be on file before the petition can be considered. Should advanced standing be granted, the credit will count; however, the grade will not be used in calculating the cumulative grade point average.

Extended programs, including undergraduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow, or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination if required in the chosen degree or field of instruction.

Second-group courses (numbered 101-200) may be counted toward the master's degree only when registration for graduate credit has been approved at the time of registration by the dean and the designated faculty advisor. No work counted toward a bachelor's degree may be counted toward a master's degree.

Full-time students are normally expected to register for nine to 12 semester hours each semester. A graduate student who is employed more

than 20 hours a week may not take more than six semester hours. All work for a master's degree *must be completed in five years, unless* an extension of time is granted by the dean.

Students who expect to continue studies for the degree of Doctor of Business Administration or Doctor of Public Administration after receiving the master's degree should ask for assistance in planning programs so that they may qualify for admission to candidacy for the doctorate.

No credit is granted for work done *in absentia* or without formal instruction, except for hospital residency, supervised field experience, and the thesis, which may be completed *in absentia* with the permission of the department, designated faculty advisor, or committee concerned.

MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in certain degrees and fields of instruction. Degree candidates should consult designated faculty advisors about examinations required and material to be covered. In writing the examinations students are expected to correlate what has been learned in course work and from the literature of the field. The examinations normally require four to eight hours. Sections broadly cover the various fields which the candidate has selected.

Examinations are generally scheduled in the fall and spring semesters and should be taken during the last semester of course registration or shortly after completion of prescribed course work.

A written application is filed with the department supervising the student's field of study at the time of registration for the semester in which the examination is to be taken. Before applying, the student must have completed all courses in the program or be enrolled in the last semester and must have achieved a 3.00 (*B*) average. After applying for the examination, a candidate may withdraw only by written notice to the department chairman.

A candidate who fails the examination should consult with the designated advisor as to a subsequent course of action.

SCHOLARSHIP REQUIREMENTS

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *CR*, Credit; *W*, Authorized Withdrawal; and *Z*, Failure, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be balanced by a grade of *A* in a graduate course of equal status. A minimum grade-point average of 3.00 is required for award of a graduate degree. All courses taken after matriculation as a graduate student (except for *Audit* or *CR*) will be used in the calculation of the grade-point average.

A student whose quality-point index falls below 3.00 will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of *F* in a required course, and permitted to continue in graduate studies, must repeat the course and achieve at least the grade of *B*. (Such a retake does not expunge the grade of *F* and it remains part of the student's record.) Should this level of performance not be obtained, the student will be denied further registration as a degree candidate.

SUSPENSION

A graduate student who does not meet the conditions of probation (see above) will be suspended or asked to withdraw. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence which indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index a second suspension will result and subsequent readmission will be denied.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 47.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the Dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible so as to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the Dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the Faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time is granted. The stu-

dent must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis 300, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER OF ACCOUNTANCY

The Master of Accountancy degree is designed to prepare students for professional careers in accounting. Although accounting careers may be in the public or private sector, a particular objective of the program is the student's attainment of professional certification. The Master of Accountancy is recognized as the necessary fifth year of education in a professional accounting program, and as such, it is superimposed on a Common Body of Knowledge in accounting and business subjects. The Common Body of Knowledge is ordinarily attained by the completion of a bachelor's degree in accounting or business from an accredited institution of higher education.

The program consists of 54 semester hours of course work, of which 24 may be waived if comparable study has been completed prior to admission. Six semester hours of course work of the minimum program of 30 hours may be awarded as advanced standing.

Students should verify state regulations concerning the Certified Public Accountant Examination for the state in which they plan to practice.

The program of study consists of two levels.

First Level:

Common Body of Knowledge Courses (24 semester hours)
Acct 201, 211; BAd 220, 240; Econ 217; Mgt 205, 218, 270
This set of courses must be completed prior to enrollment in Second-Level courses.

Second Level:

Acct 221, 225, 251, 255, 261, 275, 282 and 297; plus two courses chosen from Acct 262, 263, 264.

MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration degree is recognized as the best preparation for careers in management. The program of study leading to the Master of Business Administration provides a basic foundation in the functions of business, the environment in which it operates, and the analytical tools needed for intelligent decision-making. The program provides a study in depth in one field of instruction and a broad exposure to subjects and issues at the general management level.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed at a regionally accredited college or university prior to admission. Thus, the minimal program is at least 33 semester hours.

The program of study consists of two levels and contains four components.

First Level:

Common Body of Knowledge Courses (30 semester hours)

Econ 217–18; Acct 201; Mgt 205, 218, 270; BAd 201, 220, 240, 297

This set of courses must be completed prior to enrollment in Second-Level courses, except for BAd 297 which must be taken in the last semester of the program. All of these course requirements, except BAd 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. Common Body of Knowledge courses not completed before the applicant matriculates in the School of Government and Business Administration will be assigned in the letter of admission. First-Level courses may not be taken to satisfy Second-Level requirements (breadth, field of instruction, or elective courses).

Second Level:

1. Breadth Courses (15 hours)

This set of courses provides exposure to a broad range of subjects intended to develop professional competence in general management. In consultation with the designated faculty advisor, the student selects five courses from at least four teaching fields outside the field of instruction. Thus the student has the flexibility to design a program in consultation with the designated faculty advisor that is tailored to individual career goals.

2. Field of Instruction Courses (12 hours)

The purpose of this set of courses is to give the student an understanding in a selected field. Courses are selected in consultation with the designated faculty advisor and may be tailored to individual interests.

3. Elective (3 hours)

The student may select any graduate-level course to satisfy this requirement in consultation and with the approval of the designated faculty advisor.

4. Required Common Body of Knowledge Course (3 hours)

This course, BAd 297, Business Policy Formulation, is a required capstone course for all MBA students. It must be taken in the last semester.

Fields of Instruction

Students select a minimum of 12 semester hours from one of the following fields.

BUSINESS ECONOMICS AND PUBLIC POLICY

This field is directed toward understanding, analyzing, and dealing with the principal forces shaping the total business environment. Special attention is paid to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the economy. Students concentrating in this area take courses that survey the social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of government programs and of business response to these programs. Elective courses may be chosen in business representation, public decision-making, government regulation of business, government-business liaison functions, and public administration.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range

planning, reporting and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than a form of substantive difference.

GENERAL MANAGEMENT SYSTEMS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policy-maker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational and societal problems. Professional and academic career potentials are available in the following fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional/environmental interface management or consulting; (3) system-focused organization development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multi-governmental agencies such as OECD, as well as in the agencies and departments of national governments.

INFORMATION SYSTEMS MANAGEMENT

This field is designed to provide a managerial understanding of the principles of manual, mechanical, and electronic information processing, including computer programming concepts, methods, and languages; an appreciation of the capabilities, limitations, and selection procedure of information processing equipment; a knowledge of all phases of management information systems development, implementation, and evaluation; and an understanding of the roles of both management and systems personnel in information technology. It also provides an appreciation of the role of information systems as a tool of management.

Students participate in the development of management information systems; in the selection of computer equipment; and in the installation, management, and evaluation of management information systems—during class sessions.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in firms operating on a multinational basis or about to enter the international field; for

careers in the federal government and in international agencies concerned with business, industry and finance abroad; and for the commerce option of the Foreign Service Officer Examination.

This program is also designed to provide international students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor according to the student's background and interests.

MANAGEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of "state-of-the-art" technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

MANAGEMENT PLANNING AND CONTROL

This field provides an integrative approach to the study of management systems for strategic planning and operational control to improve organizational effectiveness and efficiency in decision making through the use of accounting and interdisciplinary administrative theory and practice. Major topics include scientific methods for acquiring reliable knowledge; accounting and statistical decision theory, models, and the subsystems of the management planning and control systems. Courses encompass centralized and decentralized resource allocation, capital budgeting systems, inventory decisions, matrix algebra, network methods, cost price-volume decisions, decision making under uncertainty, Bayesian decision theory, and value of information.

MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are *Marketing Management, Buyer Behavior,* and *Marketing Research.* Functional courses are *Promotion Management, Marketing Channels, Marketing Strategy,* and *Product/Service Management.* Specialized elective courses, *International Marketing, Industrial and Government Marketing,* and *Marketing and Public Policy,* utilize the resources of the Washington metropolitan area.

ORGANIZATIONAL BEHAVIOR AND DEVELOPMENT

This field of study reflects the assumption that the effective utilization of the behavioral sciences is concerned with both means and ends; that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a human system's total resources.

This program helps to meet the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem-solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions and local, state and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations and manpower utilization.

PROCUREMENT AND CONTRACTING

This field responds to a demand for greater professionalism imposed by the increasingly diverse goods and services created by our modern economy. As this diversity grows, organizations find the most efficient, and often the only, method of meeting needs is through procurement action. A sustained growth in purchase volume, variety, and complexity has occurred in both public and private sectors. This growth places ever greater demands upon the skill and resourcefulness of procurement and contracting personnel. The field has therefore been designed with the following objectives: (1) to provide a broad professional education in the knowledge and skills necessary for success in this field; (2) to help the student develop increased ability in analysis, decision-making, and communications; (3) to enhance the student's understanding of the economic, social, legal, and technological considerations present in procurement and contracting activity. This field of instruction is available in an elective field for Master of Public Administration students.

QUANTITATIVE ANALYSIS FOR DECISION-MAKING

This field develops a thorough understanding of quantitative or mathematical approaches to problems of managerial control and decision-making. While the program will develop a competent background in basic mathematical theory associated with the various techniques, it is oriented toward applications of the techniques rather than their theoretical mathematical content.

MASTER OF HEALTH SERVICES ADMINISTRATION

This 54-semester-hour program is designed to provide a core of generalist administrator courses for all students, coupled with specialized elective fields of instruction to meet the interests and career objectives of individual students.

The generalist core includes the following nine courses: HSA 202, 203, 207, 208, 209, 210, 212, 215, and Mgt 210. In addition, each student must take two advanced HSA courses, one chosen from Group I and one from Group II, from among the following:

Group I (Policy/Planning)—HSA 221, 223, 225, 227, 252, 255.

Group II (Management)—HSA 231, 233, 235, 236, 237, 238, 239.

During the last semester on campus, each student must also complete HSA 245 which serves to integrate the concepts and methods of health services administration.

The fields of instruction are each comprised of 18 credit hours, including an experience-based learning component. In some fields of instruction, a one-year (9-semester-hour) administrative residency is mandatory. In other fields of instruction the student may choose a 3-semester-hour internship and 6 semester hours of additional course work as a substitute for the 9-hour residency. Consequently, fields of instruction fall into one of two patterns:

Residency Option—Specialist course work, 9 hours; administrative residency, 9 hours.*

Internship Option—Specialist course work, 15 hours; administrative internship, 3 hours.

Courses comprising the field of instruction may be taken in the Health Services Administration Department, the School of Government and Business Administration, the University, or the Consortium of Universities. Each student develops a set of conceptually related courses suitable for the field of instruction and the individual's career objectives. The choice of courses must be approved by the individual's faculty advisor and the department(s) offering courses.

This curriculum structure gives students an unusual opportunity to develop academic programs particularly suited to their needs. The core courses and the two advanced HSA courses provide students with generalist administrative competence; the nine fields of instruction offer a wide choice of areas in which to develop special expertise. In all but three fields of instruction, students have a choice concerning the amount of experiential learning they wish to include in their programs of study. This choice concerning the amount of field experience can affect the number of months required to complete the program; that is, for a full-time student the residency option will require 28 months, while the internship option will require 20 months.

* Students will not be permitted to enter any administrative residency unless they have attained a 3.0 grade-point average with no grades of *I* (Incomplete).

Fields of Instruction

MANAGEMENT OF ACUTE CARE HOSPITALS*

This field of instruction is designed to provide an understanding of the organization, management, and interrelationships of hospital clinical, support, and administrative functions, and analysis of systems and procedures used to provide short-term inpatient services. Students are also provided with a managerial base in the areas of health services policy making, regulation, and legislation.

MANAGEMENT OF LONG-TERM SERVICES*

This field explores a wide range of medical and support services required on a recurring or continuous basis by individuals who are unable to function independently due to chronic mental or physical impairment. These services are provided in a variety of settings, including homes for the aged, chronic care, rehabilitation or psychiatric hospitals, hospitals or homes for the mentally retarded and developmentally disabled, geriatric centers, and the client's home. The field also provides a management base in the areas of health services planning, policy making, regulation, and legislation as applied to long-term care.

MANAGEMENT OF AMBULATORY HEALTH SERVICES*

This field addresses the critical need for managing the delivery of health and medical services to individuals who do not require the constant supervision associated with inpatient care and who either can travel to the site where service is provided or can be treated in their domicile. Although this definition includes such activities as individual practice of medicine, instruction will focus only on the management of services in organizational settings in which two or more individuals are engaged in delivering ambulatory care as a service offered by a formal organization. Examples of settings for ambulatory services are hospital outpatient departments, medical group practices, health maintenance organizations (HMOs), and public health center clinics. Ambulatory services administrators also work in the areas of health services planning, policy making, regulation, and legislation.

HEALTH INFORMATION SYSTEMS

This field is designed to provide an understanding of information systems as they are used in the administration of health services. The application of electronic data processing or computers to health care is stressed. Although some knowledge of programming languages will be necessary, the concepts of information and computer systems will be emphasized. Examples of the areas of application are medical records, program evaluation, community/national health statistics, financial management assessment, and productivity control.

HEALTH SERVICES FINANCIAL MANAGEMENT

This field responds to a demand for a thorough understanding by the

* Nine-hour administrative residency is mandatory in this field of instruction.

administrator of financial management in health institutions. The instruction includes managerial accounting, cost analysis, financial decision making, capital formation, and investment analysis, with specific adaptation to unique problems within the health care field.

HEALTH SERVICES MATERIALS MANAGEMENT

This field explores the management of physical resources in health service institutions. The instruction focuses on the purchasing and management of supplies and equipment, inventory management, contracting, cost allocation, plant operations, and facilities maintenance.

HEALTH SERVICES POLICY, MARKETING, AND PLANNING

This field is designed for those who wish to focus on strategic planning and marketing of health care systems and health care institutions and on health policy development and analysis. An emphasis on policy skills will enable the student to develop realistic and accurate statements of principles that can guide the health activities of governments, institutions, and other organizations. An emphasis on planning and marketing skills will enable the student to develop strategies based on values expressed by health services policies and to conduct marketing activities within health services organizations. Skills related to achieving acceptance of policies and implementation of plans will also be developed. The overriding concept is that of strategic health decision-making in an atmosphere of systematic inquiry with an awareness of values.

HEALTH SERVICES AND OPERATIONS RESEARCH

This field deals with the application of research techniques and methodologies to the delineation of policy issues and the generation of solutions to problems in the organization, delivery, and financing of health services. Operations research is the application of mathematical techniques such as linear and nonlinear programming, queuing models, and simulation to develop solutions for operating and policy problems.

HUMAN RESOURCES MANAGEMENT

This field covers resources planning, allocation, utilization, and development, and evaluation of health services personnel. Included are the various personnel functions, the development of personnel policies and procedures, employee and labor relations, and collective bargaining.

MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration (MPA) degree program prepares the student for a professional career in public service. The 42-semester-hour program, outlined below, is intended to provide both a generic core for all students and specialized elective fields tailored to the interests and career objectives of each individual student. The curriculum provides graduate instruction in all areas recommended by the Guidelines and Standards for Professional Master's Degree Programs issued by the National Association of Schools of Public Affairs and Administration.

All students are required to complete an eight-course (24-semester-hour) core, which includes courses in public administration and management,

public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the program, students are required to take PAd 289 which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide him or her with deeper and broader knowledge in a field of particular interest. The elective fields generally require a four-course sequence. The program is sufficiently flexible that, with the approval of a faculty advisor, the student may design a special field when none of the fields offered matches individual learning and career objectives.

Students who lack substantial knowledge of the structure and functioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 213 *Administration in the Federal Government* or PAd 242 *Administration of State and Local Governments*. The remainder of the program consists of two elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.

Because the public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

Required Courses

PUBLIC ADMINISTRATION REQUIRED CORE (24 semester hours)

1. PAd 205 Introduction to Public Administration and Management
2. PAd 295 Research Methods
3. PAd 296 Statistical Applications in Public Administration
4. PAd 261 Policy Analysis in Public Administration *or*
   PAd 260 Policy Formulation and Administration
5. Mgt 210 Individual and Group Dynamics in Organizations
6. PAd 221 Organization Theory and the Public Sector *or*
   PAd 223 Behavioral Factors in Large and Complex Organizations
7. PAd 252 Public Expenditure Analysis and Planning
8. PAd 289 Public Program Management and Policy Implementation

ELECTIVE FIELDS (12 semester hours) (See below)

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 semester hours)

Either PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments, is recommended as an introductory course. Either course may be counted as 3 of the 12 semester hours required in the elective field.

ELECTIVE COURSES Two courses (6 semester hours)

Elective Fields*

The eight elective fields offered within the Department of Public Admin-

* Students may also elect such other standard four-course SGBA fields as: Business, Economic, and Public Policy; Human Systems; Information Systems Technology; International Business; and Quantitative Analysis for Decision-making. Students may also take an approved four-course sequence in the Department of Health Services Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification specifying the courses to be taken, and submits it by petition through the faculty advisor.

istration are described below. Other SGBA fields are described elsewhere. Twelve semester hours are required for each field.

BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of intergovernmental finance in a Federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

EXECUTIVE, LEGISLATIVE, AND REGULATORY MANAGEMENT

This field offers the student a broad understanding of some of the major functions critical to effective public management, including personnel, budgeting, and the law. For those entering the MPA program directly from an undergraduate program, this field provides insight into several potential areas for future specialization, employment, or research. For mid-career public officials, this field provides the opportunity to explore more systematically and analytically the governmental functions they have observed in practice.

MANAGING IN PUBLIC ORGANIZATIONS

This field gives primary attention to the processes by which organizations are structured and their work undertaken. It includes courses in organizational theory, but is also concerned with the management of governmental programs. It is for students who envision careers in administering public sector programs.

MANAGING STATE AND LOCAL GOVERNMENTS

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processes of public decision-making, and to develop abilities to analyze and evaluate those processes. This field is most directly appropriate for those who now hold or anticipate taking staff analyst positions in government agencies, or similar positions in research or consulting firms.

PROCUREMENT AND CONTRACTING

This field covers the many activities of government performed under contractual arrangements. Increasingly, public agencies find the most efficient, and often the only, method of meeting needs is through procurement action. This dimension of public administration is often subject to unique practices and regulations, and requires the acquisition of specialized knowledge and skills in the processes of procurement and contracting.

This elective field, offered jointly with the Department of Business Administration, promotes a better understanding of public-private interactions in procurement activities.

PUBLIC PERSONNEL ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administration with personnel, the staffing function of public organizations, and labor relations in the public sector. Courses are also offered in manpower development and the use of human resources. Graduates concentrating in this field typically work in personnel administration at some level of government.

TELECOMMUNICATIONS MANAGEMENT

This field is designed for public managers who will find it valuable to understand the various capabilities of telecommunications to organize and utilize information within an organization, to appreciate the policy issues involved in the regulation of telecommunications, and to be conversant with the terminology and structures of telecommunication systems.

Internships

Students with little or no professional experience are strongly encouraged to take an internship during the MPA program. There are many opportunities in the Washington area for intern experiences in Federal agencies, in county and city government agencies, and in the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid, and taken for credit or not for credit. To receive academic credit, students must have completed nine credit hours in the degree program. In general, internships for credit involve 15-20 hours of work per week for 14 weeks.

MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

The Master of Science in Information Systems Technology provides preparation for a career in the application of computers to the data and information problems found in organizations today. The program emphasizes a practical understanding of contemporary design and implementation approaches utilized in the development of computer-based systems.

Degree Requirements

1. Twenty-one semester hours of prerequisite courses or equivalents as follows: Mgt 118, 119, 120, 121, 122; Math 31 and 32, or 51 and 52.
2. Completion of 30 semester hours of graduate course work with a QPI of 3.0, including the following courses plus 6 semester hours of electives: Mgt 241, 244, 245, 246, 247, 248, 250, 251.
3. Successful completion of a comprehensive examination.

MASTER OF URBAN AND REGIONAL PLANNING

The program of graduate study in Urban and Regional Planning leads to the professional planning degree of Master of Urban and Regional Planning. It is designed as preparation for careers on the municipal, county, state, and national levels, and for private practice. The course of study is designed to provide a broad education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Each student's program is designed in consultation with an assigned faculty advisor in accordance with individual career plans.

The degree is awarded by vote of the Faculty after satisfactory completion of (1) from 45 to 50 semester hours of course work, depending upon the background and experience of each individual student, including a thesis equivalent to six semester hours (most students will ordinarily be required to take 50 semester hours); (2) a minimum of three months' full-time professional training in a planning agency under qualified supervision, with an acceptable written report to be submitted after completion of the training period; (3) a written Master's Comprehensive Examination; and (4) a thesis based on the candidate's research in the field of urban and regional planning.

POST-MASTER'S GRADUATE CERTIFICATE IN HEALTH SERVICES ADMINISTRATION

Students with a master's degree in an approved related field or with a master's degree and managerial experience may undertake studies leading to the Post-Master's Graduate Certificate in Health Services Administration. This program serves people who plan to begin a career in management, policy-making, or planning in the field of health services or who wish to supplement previous graduate study in health services administration.

Most students with adequate preparation in health services administration or a related management field should be able to complete the requirements by undertaking a 30-semester-hour program of study. Those lacking specialized preparation will need additional course work depending on career goals. Field experience assignments, if required, are in addition to the 30-semester-hour minimum.

Individual programs will be developed in consultation with a faculty advisor on the basis of the student's educational background, experience, and specific professional objectives.

All students must take at least one doctoral-level seminar in health services administration (HSA 310 or 330) and complete a 3-semester-hour research project (HSA 270). The remaining hours may be taken in health services administration or other appropriate disciplines.

DOCTORAL PROGRAMS

Study for the degree of Doctor of Business Administration (D.B.A.) and Doctor of Public Administration (D.P.A.) is supervised by the Committee on Doctoral Studies.

Admission

The minimum admission requirement is a bachelor's degree from a regionally accredited college or university, preferably with a major appropriate to the proposed field of study. Applicants whose degrees are in fields other than business or public administration are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are encouraged, but not required, to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Arrangements to take these tests must be made with the Educational Testing Service. Students whose native tongue is not English must also submit the Test of English as a Foreign Language (TOEFL) scores.

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

This evaluation takes three to four weeks, after which the Admissions Office notifies each applicant, through the mail, of the Committee's decision. Completed applications must be sent to the Admissions Office, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions, and by October 1 for the spring semester. Graduates of non-U.S. universities must apply by February 1 for the fall semester and summer sessions, and by September 1 for the spring semester.

Plan of Study

The doctoral programs in both Business Administration and Public Administration consist of two major parts: the pre-dissertation stage and the dissertation stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the major and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution to the existing body of knowledge on business administration or public administration. Such a contribution can be either applied or theoretical. The total program must be finished in seven years; extensions beyond this time limit can be given by the Committee on Doctoral Studies only under very special circumstances.

The pre-dissertation stage is based on an individual study plan developed by the student under the guidance of a major and supporting field advisor during the first academic year. In the study plan the student must state long-range professional objectives, all proposed academic activities, methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the degree they seek and of the major field of study, must include in their Study Plan Mgt 390, *Philosophical Foundations of Administrative Research*, and the multidepartmental course, 311-312, *Seminar: Public-Private Sector Institutions and Relationships*. These courses should be taken during the first academic year after admission.

In addition to the evaluation methods proposed in the study plan, the major and supporting field advisors are expected to evaluate the student's progress at the end of the first and second semesters after admission, and thereafter before the end of the spring semester of each academic year.

Major and supporting fields of study include:

Accounting
Business Economics and Public Policy
Finance and Investment
General Management Systems
Health Services Administration
Information Systems Technology
International Business
Management of Science, Technology, and Innovation
Marketing
Materials and Operations Management
Organizational Behavior and Development
Personnel Management
Public Administration
Quantitative Analysis for Decision-Making
Taxation
Urban and Regional Planning*

A student seeking a D.P.A. degree is required to take public administration at least as a supporting field, to include in the study plan three doctoral-level courses in public administration, and to engage in activities as specified by the field advisor.

While the major field of study must be selected from the above list, supporting fields can be chosen from other departments of the University. A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration, see the *Handbook of the Doctoral Programs in Business Administration and Public Administration*, available in the Doctoral Programs Office.

SPECIAL PROGRAMS

Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in training carefully selected young men and women for administrative leadership in government career service. Each scholarship provides full tuition for two three-hour courses in one semester, and interns who maintain satisfactory standing in both their academic program and their government training program may qualify for a second scholarship for an additional semester.

Continuing Education in Health Services Administration

A nondegree program is conducted, both on campus and off campus, in the various areas of health services administration whenever a sufficiently large class is organized. Institutes, workshops, and lecture series are con-

* Can be selected only as a supporting field.

ducted under the auspices of program faculty and selected leaders from local, state, and regional areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

International Institute for Health Services Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Services Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in world-wide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

Combined Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the School of Government and Business Administration. Students must be admitted both to the National Law Center and, separately, to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Certification of Purchasing Managers

The School of Government and Business Administration participates in the three nationally recognized certification programs.

Certified Public Purchasing Officer (CPPO)
Administered by:
National Institute of Governmental Purchasing
1001 Connecticut Avenue, N.W.
Washington, D.C. 20036

Certified Professional Contracts Manager (CPCM)
Administered by:
National Contract Management Association
Crystal Plaza #1, Suite 808
2001 Jefferson Davis Highway
Arlington, Virginia 22202

Certified Purchasing Manager (CPM)
Administered by:
National Association of Purchasing Management
11 Park Place
New York, New York 10007

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS

Dean B.M. Sapin

FACULTY 1982-83*

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Adjunct Professors T.F. Carroll, J.F. Coates, V.T. Coates, E.M. Hadley, J. Hardt

Professorial Lecturers J.J. Dziak, B. Ramundo

Associate Professors E. Berkowitz, B.L. Boulier, J. Chaves, J.J. Cordes, C.F. Elliott, C.J. Herber, W.R. Johnson, J.E. Kwoka, C.A. Linden, C. McClintock, H.R. Nau, G.A. Olkhovsky, E.O. Pederson, J. Pelzman, L.P. Ribuffo, A.M. Yezer, R.Y. Yin

Assistant Professors W.A. Anderson, M.A. Atkin, M.D. Bradley, C.J. Deering, H.B. Feigenbaum, C.C. Joyner, J.H. Lebovic, D.L. Lee, R.W. Rycroft, M. Sodaro, G.C.Y. Wang, H.S. Watson, S. Wolchik

Committees 1982-83†

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COMMITTEE ON EAST ASIAN STUDIES

W.R. Johnson *(Chairman)*, H.C. Hinton, Y.C. Kim, C. Shih, G. Sigur, R. Thornton, R.Y. Yin

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of the School of Public and International Affairs.
† The Dean of the School is an *ex officio* member of all committees.

COMMITTEE ON RUSSIAN STUDIES

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COMMITTEE ON WORK-STUDY AND INTERNSHIP PROGRAMS

C.J. Deering, C.C. Joyner, P.F. Klarén, H.R. Nau

INTRODUCTION

With the establishment in 1898 of the School of Comparative Jurisprudence and Diplomacy, the study of government was first organized as a separate entity in the University. In 1928, this School was reorganized and broadened as the School of Government. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school, and the School of Public and International Affairs, a primarily policy-oriented school.

Programs of the School of Public and International Affairs are interdisciplinary, and emphasize both domestic and foreign governmental policy. The School itself offers no courses but draws upon the course offerings of the various academic departments of the University.

Students in the freshman and sophomore years are registered in Columbian College of Arts and Sciences, the liberal arts college of the University, and are assigned special advisors from the School of Public and International Affairs to assist them in planning their programs.

Academic Programs

The School of Public and International Affairs offers undergraduate programs in Chinese Language and Literature, East Asian Studies (China or Japan), and Urban Affairs; undergraduate and graduate programs in International Affairs, Middle Eastern Studies, and Public Affairs; and graduate programs in East Asian Studies, Latin American Studies, Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy. Special programs in Soviet, Far Eastern, and East European Studies are offered by the School's Institute for Sino-Soviet Studies.

Objectives

Five undergraduate programs of study—East Asian Studies, Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs—are aimed at preparing the student to understand major contemporary issues in international affairs or in domestic public affairs. The programs are designed not to produce narrow professional specialists, but to foster a liberal education, interdisciplinary in nature and broader than a concentration in one of the conventional disciplines. In each program there is double effort: to develop a background as broad and as deep as possible in order to assist in

the understanding and analysis of modern problems and to give instruction in some useful tools of analysis. The program in Chinese Language and Literature is closer to the traditional liberal arts pattern, emphasizing language and culture.

The graduate programs leading to the degree of Master of Arts are more concentrated. The student is expected to develop a greater competence in an area or a discipline, building on the student's undergraduate program in preparation for professional employment in government, in international organizations, in business, or in private agencies concerned with public or international affairs.

REGULATIONS

Regulations concerning admission, registration, fees, and finances are stated on pages 20-33; other University regulations, on pages 46-53.

Attendance

Students may not attend classes until registration is completed and fees due are paid.

Students are held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor before provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal after the end of the fifth week of classes (fall or spring semester) without academic penalty is permitted only in exceptional cases (see "Withdrawal," page 48).

THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of Chinese Language and Literature, East Asian Studies (China or Japan), Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs.

ENTRANCE REQUIREMENTS

The satisfactory completion of the Chinese Language and Literature, East Asian Studies, International Affairs, Public Affairs or Urban Affairs curriculum in Columbian College of Arts and Sciences (see pages 78-80), or the equivalent, is required.

GENERAL REQUIREMENTS FOR THE DEGREE

The following requirements apply to both the standard 120-semester-hour and the special 90-semester-hour programs. See pages 174-75 for additional requirements for the 90-semester-hour program.

Academic Work Load

Normal academic work load for the full-time student is 15 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean.

Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in human kinetics and leisure studies cannot be included in the required hours); and (2) grades of *A* or *B* in four three-semester-hour courses in the major, to be taken in residence at George Washington University. The major includes the required second-group courses (101-200) and courses taken in the group options.

DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index* in course work is placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The rules below govern probation and suspension and are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester or the three summer sessions. For students taking less than 12 semester hours in any one semester or summer session, these rules are applied on the basis of 12 or more hours taken during two or more semesters or summer sessions.

PROBATION

Students who in one semester receive two grades of *F*† in courses carrying three or more semester hours of credit each, or the equivalent, are placed on probation. Those on probation who receive one grade of *F* in such a course will be continued on probation for a second semester. Those on probation taking 12 or more semester hours whose grades are all *C* or better are removed from probation.

SUSPENSION

The following three cases constitute grounds for suspension: (1) three grades of *F*† in courses carrying three or more semester hours of credit

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* See page 47 for explanation of the quality-point index.

† In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

or the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. Students readmitted after suspension are on probation. Those who are still on probation after completing 24 credit hours, will be suspended. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 47.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Public and International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Public and International Affairs.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

Study Abroad

Students wishing to study abroad must consult with their advisors and the dean, because arrangements must be made on an individual basis. Students should receive the dean's approval, in advance, for their plan of study abroad if they plan to have the credits earned abroad apply to the degree program in which they are registered. A catalogue or other description of

the foreign institution or study program should be presented for consideration together with detailed descriptions of the courses to be taken. Students of international affairs are encouraged to travel and study abroad.

Pass/No Pass Option

A student in the School of Public and International Affairs who has a cumulative quality-point index* of 2.5 or better may, with the approval of the advisor and the dean, take one course each semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *P* or *NP* is normally assigned) may not be taken on a pass/no pass basis. A transfer student may not elect to take a course on a pass/no pass basis until the second semester of enrollment in the University. Students in the School of Public and International Affairs may take no more than six courses in which the grade of *P* or *NP* is assigned, including those in which the grade of *P* or *NP* is normally given and those taken in any other college, school, or division of the University prior to transferring to the School of Public and International Affairs.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree.

Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores in Columbian College of Arts and Sciences, petition the dean of the School of Public and International Affairs for admission to a special 90-semester-hour degree program in the School of Public and International Affairs. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the School of Public and International Affairs at the beginning of the junior year.

The basic assumption of this program is that the student can waive at least 30 semester hours of freshman or introductory requirements.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of *A* in 50 percent of the total course work, and also in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).

* See page 47 for explanation of the quality-point index.

3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101-200) as soon as they are qualified to do so, and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

CURRICULUM REQUIREMENTS

To be recommended by the faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work (see pages 78-80), a minimum of 60 semester hours during the junior and senior years, as set forth in one of the following curricula.

Earning Credit or Waiving Requirements by Examination

For information on earning credit by examination or waiving curriculum requirements, see Columbian College of Arts and Sciences, pages 76-77.

Degree Programs

Requirements for the six programs of study leading to the degree of Bachelor of Arts are listed below. Students should consult the appropriate department in the "Courses of Instruction" section of this *Bulletin* for complete course descriptions.

CHINESE LANGUAGE AND LITERATURE

Prerequisite—A minimum of 60 semester hours in Columbian College (see pages 78-79) or the equivalent from another accredited institution.

Requirements for the Major—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Students in the Chinese language and literature program may study abroad in the junior year.

EAST ASIAN STUDIES (China or Japan)

The major in East Asian Studies is designed to introduce the student to a non-Western culture and to provide an understanding of the history, politics, and economy of modern China or Japan. The major is interdepartmental and is recommended for students who wish a comprehensive study of one of the world's major civilizations and for those who contemplate graduate study in Chinese, Japanese, or Far Eastern affairs.

A junior year abroad is available in this program of study for those interested in China. Students should contact the chairman of the Department of East Asian Languages and Literatures.

Prerequisite—The East Asian Studies curriculum, page 79, including Chin 5–6 or Japn 3–4.

Requirements for the Major—(1) Chin 11 (China focus) or minimum of three additional hours of Japanese (Japan focus), and Chin 163 or 164; (2) Econ 169 (China focus) or 170 (Japan focus); (3) three semester hours selected from Geog 2, 127, 132, 133, 134, 146, 154, 164, or 266; (4) nine hours selected from Hist 137, 187, 188, 189, 195, 196 (either Hist 187 or 196, but not both, may be selected); selection covering both pre-modern and modern periods encouraged; (5) PSc 170 or 173; (6) nine semester hours of course work in economics, history, or political science *not related* to China or Japan, to be selected in consultation with and approved by the advisor; six semester hours in research and writing seminar related to China or Japan and taken in discipline of concentration.

MIDDLE EASTERN STUDIES

The major in Middle Eastern Studies introduces the student to this region through interdepartmental studies.

Prerequisite—The Middle Eastern Studies curriculum, page 79.

Requirements for the Major—(1) six semester hours of a third year of a modern foreign language; (2) three hours of either religion, art, philosophy, or literature of the Middle East; (3) three semester hours selected from Geog 125, 126, 127, 132, 145, or 146; (4) six semester hours selected from Hist 107, 108, 109, 110, 158, 193, or 194; (5) six semester hours selected from PSc 177, 178, 179, or 180; (6) nine semester hours of course work in economics, history, or political science *not* related to the Middle East, to be selected in consultation with and approved by the advisor; six semester hours of research and writing seminar related to the Middle East and taken in the discipline of concentration.

INTERNATIONAL AFFAIRS

The major in International Affairs enables the student to specialize in international politics, international economics, international communications, or regional studies.

Prerequisite—The International Affairs curriculum, page 79.

Requirements for the Major—(1) Econ 181–82; (2) six semester hours of a third year of foreign language (may be literature courses taught in the language); (3) three semester hours selected from Geog 2, 127, 132, 133, 134, 135, 145, 146, 154, or 161; (4) Hist 182 and one course selected from Hist 136, 150, or 157; (5) PSc 140 and 142 or 144; (6) 15 semester hours from one of the group options listed below:

Group I. International politics—courses concerned with theory and practice in international affairs, forces shaping the world scene, and American foreign policy, selected from Geog 127, 133, 134, 139, 146 (if not elected to satisfy the major requirement); Hist 137, 139–40, 149; PSc 105–6, 107, 108, 130, 131, 146, 149, 161, 178, 182, 191, 192 (PSc 142 or 144 may be elected if not taken to satisfy the major requirement).

Group II. International economics—courses concerned with the world economy and American policy and practice in international trade and finance, selected from BAd 176, 178; Econ 101, 102, 104, 121, 122, 134, 147, 151; Geog 125, 127, 133, 134, 135; Stat 111, 112.

Group III. International communications—courses concerned with the study of international information programs, public opinion, psychological warfare, cultural relations and public relations, selected from Anth 150, 153, 157, 161, 162; Geog 106, 125; Jour 145, 146; Jour/PSc 128; PSc 120, 129, 146; Psyc 115, 151, 156.

Group IV. Regional study—a concentration in one of the following areas: (1) Africa—courses selected from Anth 178; Hist 116; PSc 180, 181, 182; (2) Europe—courses selected from Econ 147; Hist 128–29, 131–32, 141-42, 147, 149, 151–52, 158; PSc 105–6, 130, 131, 161; (3) Far East—courses

selected from Anth 173, 175; Chin 163–64, 181, 182; Econ 169; Geog 164, 266; Hist 137, 187, 188, 195–96; PSc 105, 170, 173; (4) Latin America—courses selected from Anth 170, 172, 185; Econ 185; Geog 161; Hist 163–64, 165, 166; PSc 183, 184; interdisciplinary seminar 287 (PSc 285) offered by six departments participating in the Latin American Studies program; (5) Middle East—courses selected from Anth 177; Geog 154; Hist 158, 193, 194; PSc 177, 178, 179, 180; Rel 161; or (6) Soviet Union and Eastern Europe—courses selected from Econ 133, 134; Geog 265; Hist 137, 143, 145, 146, 188; PSc 108, 131 or 165, 168; Slav 161–62, 165, 166.

PUBLIC AFFAIRS

The major in Public Affairs deals with domestic government and policy.

Prerequisite—The Public Affairs curriculum, pages 79–80.

Requirements for the Major—(1) Econ 101, 161, 162; (2) Hist 175–76; (3) PSc 114 or 115, 116 or 117, 119; (4) 12 semester hours from one of the group options listed below:

Group I. Economics—courses selected from Econ 102, 104, 121, 122, 123, 136, 142, 159, 165, 181–82; Geog 2.

Group II. Politics—courses selected from PSc 106, 110, 111, 112, 116 (if not taken as a major requirement), 117, 118, 120, 122, 124, 130, 146.

Group III. Urban affairs—courses selected from AmCv 177 or AmCv/Hist 186; Econ 157; Geog 124, 140, 141, 142; PSc 111, 112; Soc 126; U&RP 153, 154.

URBAN AFFAIRS

The Urban Affairs program is designed for undergraduates interested in urban-related occupations, in furthering their knowledge about theories and findings related to urban life, or in acquiring the tools that will help them to effectively apply themselves to the task of devising solutions to the problems that cities and their residents face. The program consists of a focused set of courses that introduces the student to the problems and issues of urban America from the perspectives of various social science disciplines.

The central focus of the program is on urban public policy—the various forces that shape it, and its adequacy relative to current and anticipated needs. Within the overall framework, students can specialize in either the political and social, economic and financial, design, or research methodological aspects of urban studies. In the senior year each student serves an internship in an urban-related agency or research organization and also attends a weekly seminar restricted to urban affairs majors. Each student is encouraged to work closely with the urban affairs advisor to develop a program tailored to personal interests and goals.

Prerequisite—The Urban Affairs curriculum, page 80.

Requirements for the Major—(1) Urban Affairs core courses: Econ 157; Geog 140; Hist 186; PSc 101, 111, 112; and one course chosen from among Stat 51, 53, or 111. (2) Special Urban Affairs fields: each student will be required to take four courses from within one of the following four fields of specialization, and two courses from each of the others. Field A. (Urban Research Methods): Geog 104, 106; Stat 51, 53, or 111; Stat 105, 107, 112, 119, 123. Field B. (Political and Social Urban Analysis): PSc 104, 111, 124; Soc 126, 128; PAd 190. Field C. (Urban Economics and Financial Analysis): Econ 101, 121, 136, 161, 162, 165; BAd 132. Field D. (Urban Design and Spatial Analysis): AmCv 177; Geog 124, 141, 142, 143; U&RP 153, 154. (3) Senior Internship and Seminar: PSc 188 and 193—

the grade of *P* (Pass) or *NP* (No Pass) will be given for PSc 188. A student may elect to fulfill the internship requirement in a paid position in lieu of registering for PSc 188; however, the student must substitute six semester hours of elective course work.

THE DEGREE OF MASTER OF ARTS

The School offers degree programs leading to the Master of Arts in the fields of East Asian Studies, International Affairs, Latin American Studies, Middle Eastern Studies, Public Affairs, Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy.

ADMISSION REQUIREMENTS

Application forms are available from the Office of Graduate Admissions, School of Public and International Affairs, George Washington University, Washington, D.C. 20052.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in the relevant undergraduate major, is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the Aptitude Test of the Graduate Record Examinations as well as letters of recommendation are required.

In East Asian Studies—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

In International Affairs—The applicant's undergraduate program should include background courses corresponding to the interdepartmental undergraduate major in international affairs at this University or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

In Latin American Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University or equivalent. Majors in other fields may be considered for admission provided that undergraduate course work includes Spanish or Portuguese and sufficient course work in one of the following six areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

In Middle Eastern Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Middle Eastern Studies at this University or equivalent.

In Public Affairs—An undergraduate major in public affairs, economics, history, or political science, depending upon the field of specialization in the master's program, is required. Students entering the program are as-

sumed to have had some college-level course work in American government and politics, American history, and economic theory. To the extent that a student lacks such a background, the student must, in consultation with an advisor, undertake the appropriate remedial course work, including some courses which may be taken for graduate credit.

In Russian and East European Studies—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131 or 168; Slav 1–2 and 3–4, or 5–6.

In Science, Technology, and Public Policy—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

In Security Policy Studies—An undergraduate background similar to that specified above for International Affairs would be appropriate. Working experience in the military or national security fields might compensate in part for inadequate academic preparation. A background in economics or quantitative analysis skills would also be helpful.

Readmission

A graduate student who has not been continuously enrolled, or on approved leave of absence or inactive status, must file an application for readmission the semester before planning to return to school. Applications for readmission are reviewed by the dean and the Committee on Admission.

GENERAL REQUIREMENTS

There are two options available in all programs leading to the Master of Arts degree except Security Policy Studies, in which only the nonthesis option is available, and East Asian Studies (with a concentration in Chinese language and literature), in which only the thesis option is available. One option requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for six semester hours of *Thesis Research* (299-300). The second option requires a minimum of 36 semester hours of graduate course work and does not include a thesis. The course work for both options is taken in preparation for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an advisor-approved "Program of Studies" (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under special circumstances second-group courses (numbered 101-200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor and the dean. The student who takes an under-

graduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than six semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than nine semester hours may be taken for graduate credit in the 36-semester-hour program. (The one exception to this rule is the case of students who select one or more fields in history; they may take nine hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean. A student who is temporarily unable to continue the program of studies may request a leave of absence not to exceed one year.

No credit is granted for work done *in absentia* or without formal instruction, except for the thesis, which may be completed *in absentia* with the permission of the curriculum advisor and the dean. No more than six semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

Tool Requirements

In most programs of study a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the appropriate language department) of at least one modern foreign language, to be approved by the dean. A master's degree candidate whose native language is not English may not select the native language to meet the tool requirement; the candidate may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the fields of Public Affairs, Security Policy Studies, and Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency at the level of Stat 105, 112, or 197.

Candidates in International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work; it must be taken before the comprehensive examination. No student may take the language or tool examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree.

Master's Comprehensive Examination

In addition to any course examinations, the candidate must pass a written

Master's Comprehensive Examination. Examinations are scheduled twice a year (usually in November and April), and should be taken during the last semester of course registration or shortly after the completion of the prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. The candidate must consult with the advisor, well in advance, as to the date of the examination and the definition of the subject-matter fields which this examination is to cover. It should be understood, however, that course work constitutes only partial preparation for the Master's Comprehensive Examination. Each student is also expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. An oral examination on the thesis or major report may also be required.

Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; and *Z*, Failure, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status.

A master's candidate who receives a grade of *F* is required to present cause for consideration by the Dean's Council as to why the student should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an "Incomplete" cannot be made up after the lapse of one calendar year. An "Incomplete" which is not removed by the end of one calendar year remains as a grade of *I* on the student's record. An "Incomplete" cannot be removed by reregistering for the course. No student will be permitted to register for courses in a new academic year, or take the Comprehensive Examinations, if there are more than two "Incompletes" outstanding on the record.

A student who fails to meet the established deadlines for completion of course work or other elements of the program (e.g., comprehensive examinations) and is granted an extension may be required by the Dean and the Dean's Council to register for three credit hours of graduate "Reading and Research" for each semester that the work is delinquent.

The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (299-300) until the thesis subject has been formally submitted to the Dean's Office. The subject must be approved by the student's advisor and the member of the Faculty under whom the thesis is to be written. The thesis in its final form must have the approval

of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Dean's Office.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous enrollment, and is allowed one calendar year to complete it. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the enire six hours of thesis again and pay tuition as for a repeated course.

Degree Programs

Specific requirements for each of the eight degree programs leading to the Master of Arts are listed below. For prerequisites, see "Admission Requirements," above.

EAST ASIAN STUDIES

The Master of Arts in the field of East Asian Studies is an interdisciplinary program which includes course work from at least four of the following disciplines: Chinese language and literature, economics, geography, history, and political science.

The degree program consists of 30 semester hours of course work, including six hours of thesis research, or 36 semester hours of course work without a thesis. Each candidate must pass a Master's Comprehensive Examination in one major and one or two minor fields. To fulfill the tool requirement candidates must demonstrate proficiency in either Chinese or Japanese language; with the permission of the dean, another East Asian language may be substituted. (As preparation for this requirement, a special Chinese language course will be available to students in the program.)

Only the 30-semester-hour thesis option is available to students selecting a concentration in Chinese language and literature. That program includes 12 semester hours of Chinese language and literature, six hours of history, six hours of electives selected in consultation with the advisor, and six hours of thesis research.

INTERNATIONAL AFFAIRS

The interdisciplinary program leading to the degree of Master of Arts in the field of International Affairs provides the student with a wide choice of fields within three broad areas of study: general, supplemental or special, and regional. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology and sociology relate to these fields, which are listed below:

General Fields of Study—International politics, comparative government and politics, modern political theory (including socialist and communist theory) and international economics.

Supplementary or Special Fields—International law; international organization and administration; international economic development; international and comparative aspects of communism; U.S. diplomatic history;

U.S. foreign policy; science, technology, and public policy; 20th century British defense and foreign policy; and U.S. national security policy.

Regional Fields—Modern history, or government and politics, or economic history and problems of one of the following: Western Europe, Eastern Europe, the Soviet Union, Latin America, the Middle East, Africa, South and Southeast Asia, Japan, and China. Within each geographical area there are normally three fields of study available.

Each degree candidate must select at least one general field. The fields should also represent at least two disciplines. Beyond these limits, the student is free to select any of the fields indicated above as long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields of study in the Master's Comprehensive Examination.

Candidates who elect to write a thesis must choose *three* of the listed fields and take, in addition to the thesis, a minimum of 24 semester hours of graduate course work in at least two departments, with no more than 15 hours in any one department.

Candidates electing a program without a thesis must choose *four* fields and may take no more than 21 of their required 36 semester hours in one department. They must also include in their program at least two research seminars (six semester hours) requiring the preparation of substantial research papers.

LATIN AMERICAN STUDIES

The program leading to the degree of Master of Arts in the field of Latin American Studies is designed to provide the student with an appropriate area background in three or four of the following fields: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

All degree candidates must complete 12 semester hours of graduate work, including the interdisciplinary seminar (287), in a major field selected from those listed above, and six semester hours in each of two minor fields selected from those listed above. Students who elect not to write a thesis, must take six semester hours in a third minor field selected from those listed above, or from the fields of urban and regional planning; economic development; population studies; international business; science, technology, and public policy; tourism development and travel administration; and women's studies. The student must further complete an additional six semester hours in any of the major or minor fields selected. The tool requirement must be satisfied by demonstration of proficiency in Spanish or Portuguese, or in English if the student's native language is Spanish or Portuguese. The Master's Comprehensive Examination will cover all the student's selected fields.

MIDDLE EASTERN STUDIES

The interdisciplinary program leading to the degree of Master of Arts in the field of Middle Eastern Studies offers the student an appropriate area background in three or four of the following fields: domestic politics, international relations, history, economics, geography and regional science, anthropology, religion, philosophy, art, and literature. One approved field from the international affairs curriculum may also be included.

The degree program consists of 30 semester hours of course work including six hours of thesis research, or 36 semester hours of course work without a thesis. In the 30-hour program, students select one major and two minor fields; in the 36-hour program, students chose one major and three minor fields. Written Master's Comprehensive Examinations in these fields will be required of all candidates at the completion of the degree program. All students must meet the prescribed basic preparation of three credit hours in Middle Eastern international relations, domestic politics, and modern history, and must satisfactorily complete the interdisciplinary seminar offered by this program. To fulfill the tool requirement, candidates must demonstrate reading knowledge proficiency in an approved modern Middle Eastern language.

PUBLIC AFFAIRS

The program leading to the degree of Master of Arts in the field of Public Affairs allows the student to specialize in either domestic economics or domestic politics. The student may select courses in consultation with an advisor to emphasize either political science, economics, or American history, provided (1) that no more than 15 hours of courses are elected in one department under the 24-hour program with a thesis, or (2) that no more than 21 hours are elected in one department under the 36-hour program without a thesis. Course work may include economics (public finance, monetary theory and policy, labor economics, industrial organization, natural resources and environmental economics, regional and urban economics, economic policy); history (U.S. political history, U.S. economic history, recent U.S. history); political science (domestic politics and government, Congress and the presidency, U.S. constitutional law and politics, state and urban politics, political science research methods, and science, technology, and public policy).

RUSSIAN AND EAST EUROPEAN STUDIES

This degree program is designed to give the student a broad grasp of Russian and East European affairs on an interdisciplinary basis, with emphasis on the period since 1917. The program provides an opportunity for students to gain knowledge of special areas of interest from among the following: Soviet internal and external affairs (required field of study), Soviet and Eastern European economics, ideology and thought, Russian literature and culture, Soviet military policy and strategy, 19th-century Russian history, comparative and international aspects of communism, Eastern European history, Eastern European government and politics, and advanced Soviet government, politics and foreign policy.

The degree program consists of 30 semester hours including 6 hours of thesis research, or 36 semester hours of course work without the thesis. All students must take 6 to 9 hours in the interdisciplinary field covering Soviet internal and external affairs. In the 30-hour program, students select two other fields and must include one course in Eastern European history or politics; in the 36-hour program, students select three other fields and must include one field in Eastern European history or politics. All candidates will be required to take Master's Comprehensive Examinations in these fields. Before the Comprehensive Examinations can be taken, Russian language proficiency must be demonstrated in a reading comprehensive

examination. All students must have the required background preparation of at least 9 credit hours in Russian history and Soviet government and politics, and 12 credit hours in Russian language study.

Students in the concentration in Russian literature and culture may take either the thesis or non-thesis option. They must take the required field in Soviet internal and external affairs in addition to the selected fields in literature and culture. The approved fields include 19th-century Russian literature, Soviet literature, and Russian culture.

SCIENCE, TECHNOLOGY, AND PUBLIC POLICY

The program leading to the degree of Master of Arts in the field of science, technology, and public policy is flexible and is carefully planned and conducted in consultation with an advisor. All degree candidates are required to take 12 semester hours in the core field of science, technology, and public policy, which includes course work both in science policy and in policy analysis. A second field must be chosen from one currently offered in the international affairs or public affairs programs of the School. Students who elect to write a thesis must select one additional field, and those who elect not to write a thesis must select two additional fields. The third and fourth fields may also be chosen from those currently offered in international affairs or public affairs, or may be interdisciplinary, developed in consultation with the advisor and focusing on a particular policy issue or area. Such a special field must be approved by the student's advisor and the dean.

SECURITY POLICY STUDIES

The 36-hour, four-field program leading to the degree of Master of Arts in the field of security policy studies is explicitly policy-oriented, and professional in the sense of attempting to prepare students for policy-oriented positions in the defense/national security field. A student's degree program will be carefully planned with an advisor. All degree candidates are required to take 12 semester hours in the core field of defense policy analysis. In addition, students should have a minimum competence in economics equivalent to Econ 217-18. At least one field should be selected from among the following: international security policy; military history/history of strategic thought; Soviet military policy and strategy; science, technology, and public policy; and advanced quantitative analysis. The remaining two fields are to be selected from any of the above, or from any other field offered in the School's various programs. The tool requirement must be satisfied by demonstration of proficiency in statistics or a foreign language.

SPECIAL PROGRAMS

Combined Master of Arts and Juris Doctor Degree Program

The School of Public and International Affairs cooperates with the National Law Center in offering a program leading to the combined degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the School of Public and International Affairs and the National Law Center. Applications should be made separately, but at the same time. Both the School and the Center should be notified that

the student is interested in the combined program. The student will be admitted to the School of Public and International Affairs for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of course work for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program which includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to six semester hours of credit for course work completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the School of Public and International Affairs and the National Law Center and must maintain this concurrent registration until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the School of Public and International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe, and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and reading courses in the disciplines of economics, geography, history, language and literature, law, political science, and psychology. Research work is integrated with the teaching program.

Students who are preparing for the degree of Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies in the School of Public and International Affairs, or for the degree of Master of Arts in the fields of economics, history, or political science in the Graduate School of Arts and Sciences, with specialization in Sino-Soviet studies, may take course work from the Institute's offerings.

Doctoral candidates in the field of political science will take their Sino-Soviet work in the form of appropriate subfields of the major and minor fields. Doctoral candidates in the field of history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences and consultative committees designated by that School which direct the work of each graduate student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. A candidate for such a degree should assume that the committee will require the substitution of a reading examination in Chinese or Russian for one of the two Western languages normally required for the degree.

DIVISION OF CONTINUING EDUCATION AND SUMMER SESSIONS

Dean W.F.E. Long
Associate Deans A.C. Jensen, S.R. Paratore
Assistant Deans G.E. Jones, B.J. Moreland, J.H. Pappalardo, A.O. Smith

INTRODUCTION

The Division of Continuing Education and Summer Sessions provides continuing education programs for adult students by administering the off-campus offerings of the colleges and schools of the University, at both the undergraduate and graduate levels. Also offered are courses, seminars, and workshops for those seeking personal enrichment or the updating and upgrading of professional credentials. Special programs of study are developed in response to specific needs of the government and business community. The Division includes a center for research on policy issues in the telecommunications industry as well as the George Washington University Television Station.

The staff of instruction for Division programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the professional community.

The Division works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study for mature students. In cooperation with sponsoring groups from government and business, the Division offers courses at off-campus centers in the District of Columbia and suburban Maryland and Northern Virginia. The Division also offers, through its Tidewater Center, graduate degree programs in various disciplines at locations in the Hampton, Norfolk, and Virginia Beach areas. A wide range of seminars and workshops is available to organizations and individuals from the professional community.

Any organization interested in having the Division organize and conduct a course or a comprehensive educational program should contact the Division of Continuing Education and Summer Sessions.

The academic standards of the University are maintained in off-campus credit courses. The Division of Continuing Education and Summer Sessions is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. All programs offered through the University's off-campus programs and administered by this Division are approved through the procedure authorized by the Board of Trustees and the Charter granted by the Congress of the United States. Degrees are granted through the faculties of the degree-granting schools and colleges of the University. Credit earned through off-campus study conforms to academic standards throughout the University. All Division off-campus offerings in Maryland are approved by the Maryland State Board for Higher Education; those in Virginia are approved by the Commonwealth of Virginia Council of Higher Education.

Except as outlined below, all general University regulations apply to students in the Division of Continuing Education and Summer Sessions.

In addition, Division students are subject to all special requirements of the school through which they are taking courses.

ADMISSION AS A DEGREE CANDIDATE IN OFF-CAMPUS PROGRAMS

Students wishing to be admitted as candidates for one of the off-campus undergraduate or graduate degree programs of George Washington University may obtain application forms from the Division of Continuing Education and Summer Sessions, one of the University's off-campus representatives, or the education officer of their agencies or installations.

Mature students who do not meet University admission requirements (see Admissions) may be considered for degree candidacy after the satisfactory completion of at least 15 semester hours of course work with a grade-point average of 2.00 or better. This must include courses in English composition (Engl 9 or 10 and 11) and 9 semester hours of course work in at least two of the following areas: humanities (literature, philosophy, foreign language), social sciences (anthropology, economics, geography, history, political science, psychology, sociology), and natural and mathematical sciences.

NONDEGREE STUDENTS

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. Formal University admission is not required for registration.

CHANGES IN PROGRAM OF STUDIES

DROPPING AN OFF-CAMPUS COURSE

A course may be dropped without academic penalty during the first third of the semester. Withdrawing from a course without academic penalty after this period requires approval of a written request, *accompanied by a completed Change Slip*, addressed to the Dean of the Division of Continuing Education and Summer Sessions. An off-campus Change Slip (obtainable from the instructor or from the Division) must be completed, signed by the student and the instructor, and submitted to the Division. The instructor will indicate on the Change Slip whether or not the student is passing. Merely reporting a withdrawal to an instructor does not constitute official withdrawal from a course. The effective date of withdrawal will be determined by the appropriate dean. A refund, if appropriate, will also be indicated by the dean.

Failure to follow the proper procedure will result in a grade of Z and, regardless of the date of discontinuance, will not relieve the student of financial responsibility for the entire course.

DEGREE PROGRAMS

Columbian College of Arts and Sciences offers the following degree programs off campus:

Associate in Arts in General Studies
Associate in Science in Cartographic Science

Associate in Science in Geodesy
Bachelor of General Studies
Bachelor of Science in Cartographic Science
Bachelor of Science in Geodesy

The Graduate School of Arts and Sciences* offers the following degree programs off campus:

Master of Arts or Master of Science

Fields and Concentrations: Administrative Science, Crime in Commerce, Criminal Justice, Employment Policy, Energy Policy, Environmental and Resource Policy, Environmental Science, Legislative Affairs, Regulatory Policy, Social and Organizational Behavior, Telecommunications Policy

Master of Forensic Sciences

The School of Engineering and Applied Science† offers the following degree programs off campus:

Master of Engineering Administration

Master of Science

Major Fields: Computer Science, Communications, Operations Research, Systems Analysis and Management

Professional Degrees (Engineer and Applied Scientist)

The School of Education and Human Development‡ offers the following degree programs off campus:

Bachelor of Arts in Education and Human Development

Major Fields: Human Services, Special Education: Complementary Teacher Program

Master of Arts in Education and Human Development

Major Fields: Elementary Education, Secondary Education, Supervision and Human Relations, Higher Education, Human Resource Development, Adult Education, Early Childhood Special Education, Vocational/Special Education

Education Specialist

COLUMBIAN COLLEGE OFF-CAMPUS PROGRAMS

Through the Columbian College of Arts and Sciences, the Division of Continuing Education and Summer Sessions offers associate's and bachelor's degree programs in General Studies, Cartographic Science, and Geodesy. Further information about these programs, which are described below, is available from the Division or from Columbian College.

Requirements for the Associate's Degrees

RESIDENCE

The last 15 semester hours must be completed in residence as a candidate for the Associate's degrees. A portion of the academic work taken to qualify for degree candidacy may be accepted in partial satisfaction of the

* For program details, see the field concerned under Courses of Instruction.
† See the School of Engineering and Applied Science *Bulletin*.
‡ For program details, see the section of this *Bulletin* on the School of Education and Human Development.

residence requirement, if the courses are approved as part of the student's degree program.

Requirements for the Bachelor's Degrees

RESIDENCE

A minimum of 30 semester hours, including at least 12 hours in the area of concentration, must be completed in residence as a candidate for the degree sought. Unless special permission is granted by the appropriate dean to pursue work elsewhere, the work of the senior year must be completed in residence. This requirement applies to students transferring within the University as well as to students transferring from other institutions. The 15 hours taken in order to be considered for degree candidacy may be counted in residence. For regulations governing military students who are transferred when they are within six semester hours of their degrees, see pages 193-94.

Associate in Arts in General Studies

Academic Advisor Debra Bearman

Upon the satisfactory completion of the requirements set by Columbian College of Arts and Sciences, the degree of Associate in Arts in General Studies is conferred. Students who plan to continue working toward an off-campus bachelor's degree offered by Columbian College must apply to the Division's Office of Student Services upon completion of the requirements for the degree of Associate in Arts in General Studies. Forms for this purpose are available from the Division office.

After completing the degree requirements, students may wish to transfer to an on-campus degree program within the University, or they may wish to transfer to another institution. However, modifications in admission, advanced standing, and curriculum requirements permitted in the Associate in Arts in General Studies degree program may not be accepted in transfer. Therefore, while registered for this degree, students should meet the requirements of the college, school, or university to which they may wish to transfer.

Scholarship—The system of grading is described on page 46. For regulations concerning probation, suspension, and readmission, see pages 70-71.

CURRICULUM

The satisfactory completion of 60 semester hours of college work in the following curriculum is required. Students who plan to pursue a bachelor's degree are advised to plan their program so that they will have satisfied prerequisites toward a bachelor's degree of their choice.

		Semester Hours
Communications:	Engl 9 or 10, 11	6
	SpDr 1, 11, 111, or 121	3
Humanities:	Nine semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; Mus 3, 4; Phil 50; Rel 9, 10, 59, 60	9

Math/Science:	Three courses selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, 3, 4; Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Ocea 103–4; Phys 1, 2, 3, 4, 9–10; Stat 51, 53, 97, 101–2	9–12
Social Sciences:	Nine semester hours are required, each course chosen from one of two departments, selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1, 2; Hist 39–40, 71–72; PSc 1, 2; Psyc 1, 8; Soc 1, 2	9
Elective:		21–24
	Total	60

Bachelor of General Studies

Academic Advisor Debra Bearman

The Bachelor of General Studies curriculum aims to provide the adult part-time student with the opportunity to obtain a broad education. For that reason the course work required in the first and second years is distributed among communications (written and oral), the humanities, natural and mathematical sciences, and the social sciences. In choosing the third- and fourth-year course work required in departments related to their concentration, students should obtain counseling through the faculty advisor.

Students planning to work toward master's degrees are advised to plan their bachelor's programs so that they will meet the prerequisite requirements of the school or college of their choice. Students planning to enter graduate programs which require a reading knowledge of a foreign language are advised to include two years of a foreign language in their bachelor's program.

Scholarship—To qualify for graduation, 120 hours of course work must be passed and an index achieved of 2.00 based on courses graded on a four-point scale. At least 60 hours of course work, including the general course requirements, must be taken outside the major department or program.

Students must also achieve no lower than the grade of *C* in required courses in the selected area of concentration. A *D* in a required course will satisfy a curricular requirement in the area of concentration and may count toward the total 120 hours, but it shall *not* count toward the minimum number of hours required in the area of concentration.

The system of grading is described on page 46. For regulations concerning probation, suspension, and readmission, see pages 70-71.

FIRST AND SECOND YEARS

		Semester Hours
Communications:	Engl 9 or 10, 11	6
	Engl 20	3
	SpDr 1, 11, 111, or 121	3
*Humanities:	Twelve semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; two	

* Students who plan to continue study for advanced degrees are urged to fulfill the two-year language option.

	years of one foreign language; Mus 3 and 4; Phil 50; Rel 9 and 10, 59, 60; Slav 91–92	12
Math/Science:	Six to eight semester hours selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, or 3 and 4; Ocea 103–4; Phys 1 and 2, or 3 and 4, or 9–10	6–8
	Six to eight semester hours selected from the following: Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Stat 51, 53, 97, 101–2	6–8
Social Sciences:	Twelve semester hours selected from two of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1, 2; Hist 39–40, 71–72; PSc 1, 2; Psyc 1 and 8; Soc 1, 2	12
Electives:	(depending on science option)	8–12
		60

THIRD AND FOURTH YEARS

Concentrations are offered in economics, history, mathematics, political science, psychology, and sociology. Concentration requirements are to be selected in consultation with the academic advisor. Students selecting economics, history, mathematics, or political science are required to complete 24 semester hours of 100-level courses in their area of concentration, and 18 semester hours of courses, selected in consultation with the faculty advisor, in two or more related departments.

Students selecting psychology or sociology are required to complete 18 semester hours of 100-level courses in their area of concentration, and 24 semester hours of courses, selected in consultation with the faculty advisor, in two or more related departments. The remaining 18 credit hours required for graduation may be in elective courses.

Associate in Science in Cartographic Science
Associate in Science in Geodesy
Bachelor of Science in Cartographic Science
Bachelor of Science in Geodesy

Director Eldor O. Pederson
Faculty Advisor Arthur Viterito

The course work in these two- and four-year curricula is offered both on and off campus. However, the cartography and geodesy courses are given primarily at selected off-campus locations. Students whose native language is not English must present a minimum TOEFL score of 525 to be considered for admission.

GENERAL REQUIREMENTS

The Associate's degree programs require satisfactory completion of 60 semester hours; the Bachelor's degree programs, 120 semester hours. All candidates for the Bachelor of Science degrees in Cartographic Science and in Geodesy will pursue a general arts and sciences curriculum until they begin work in their major field; they must complete the two general course requirements listed below. Candidates for the Associate degrees must complete the English requirement (#1) below. Except for the general course requirements, all curriculum requirements are established by the major field program.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in the field of English composition, either by examination or by taking English 9 or 10, and English 11 or 12. This requirement may not be postponed; it applies to the Associate's and Bachelor's degrees.

2. Each student in the Bachelor's degree programs must at some point in the college career undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As each major field will represent one of these three areas, the requirement must be fulfilled by taking no less than six semester hours in each of the other two areas (see pages 74-75).

Servicemember's Opportunity College

George Washington University has been designated a Servicemember's Opportunity College (SOC). SOC provides opportunities for active duty servicemen and women to pursue educational program goals through courses offered on base. In support of the concept, George Washington University, while still maintaining its academic standards, assumes the responsibilities of meeting the educational needs of an individual serving in the Armed Forces. Individuals who apply for admission as candidates for either Associate's or Bachelor's degrees from George Washington University's Columbian College of Arts and Sciences may, at their request, be designated as SOC students. Such students will be assured of a degree completion program through use of the agreement that follows.

AGREEMENT

George Washington University, a Servicemember's Opportunity College, agrees to the following:

I. Upon admission to Associate in Arts in General Studies or Bachelor of General Studies degree candidacy, the student may take the required course work either on or off campus. Regardless of where taken, courses of study taken while a degree candidate may be applied toward the degree sought, as a requirement or an approved elective. Although the grade of *D* is not acceptable for transfer, it may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for the degree, and it should not be repeated. Courses will be taken from George Washington University unless the servicemember is transferred to a location not served by this University. In the case of transfer and in consideration of the student's future assignment, arrangements will be made between the student and the counselor assigned by the Division of Continuing Education and Summer Sessions to ensure that the courses taken elsewhere satisfy the George Washington University program.

II. Academic credit may be obtained by any one or a combination of the following:

A. Registration as an on- or off-campus, full- or part-time student at this University.

B. Advanced standing for academic studies taken at other accredited institutions when such studies meet the requirements for the degree, or by examination.

Within the maximum of 42 hours of credit allowed for advanced standing toward the Associate in Arts in General Studies degree, a maximum of 30 hours may be obtained by any one or combination of the methods below. Within the maximum of 90 hours of credit allowed for advanced standing toward the Bachelor of General Studies degree, a maximum of 60 hours may be obtained by any one or combination of the methods below.

1. *College-Level Examination Program (CLEP) Subject Examinations*—see pages 22-23. Maximum credit allowed for Associate's degree is 30 semester hours; maximum allowed for Bachelor's degree is 60 semester hours.

2. *College-Level Examination Program (CLEP) General Examinations*—see pages 22-23. Maximum credit allowed is 18 semester hours.

3. *Columbian College of Arts and Sciences Special Departmental Examinations*—see page 77. Maximum credit allowed for Associate's degree is 30 semester hours; maximum allowed for Bachelor's degree is 60 semester hours.

4. *Service Schools*—A maximum of 30 (or a maximum of 12 if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the "Guide to the Evaluation of Educational Experience in the Armed Forces," issued by the Committee on Accreditation of Service Experience. Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

5. *Correspondence Courses*—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college level which are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

III. The minimum requirement for the Associate in Arts in General Studies degree is 60 semester hours; the minimum requirement for the Bachelor of General Studies degree is 120 semster hours. A minimum of 18 semester hours for the Associate's degree and a minimum of 30 hours for the Bachelor's degree must be completed at George Washington University, but may be completed at any point in the student's program of study. At least 6 semester hours in the selected area of concentration must be taken at this University.

IV. The Division of Continuing Education and Summer Sessions will handle and coordinate administrative matters and be the point of contact with the college granting the degree. The provisions as stated in the Division of Continuing Education and Summer Sessions *Off-Campus Schedule of Classes* will apply in all cases not specifically mentioned in this agreement.

V. Tuition and fees will be as stipulated in the Division of Continuing Education and Summer Sessions *Off-Campus Schedule of Classes* on a year-to-year basis.

VI. Students accepted under this program are subject to the probation and suspension regulations of the University, and are required to maintain scholastic standards.

VII. In addition to trained counselors, University representatives are assigned to each installation to assist in the counseling function.

OTHER DIVISION PROGRAMS

The Division of Continuing Education and Summer Sessions administers the activities of the Center for Continuing Education in Washington, the English for International Students Program, the Office of University Students, the Summer Sessions Office, the Center for Telecommunications Studies, and the GWU Television Station.

CENTER FOR CONTINUING EDUCATION IN WASHINGTON (CCEW)

The Center provides a broad spectrum of services focusing on innovative, nontraditional, career-oriented education. Among CCEW programs are noncredit graduate-level career certificate programs (training legal assistants, publication specialists, landscape designers, fund raising administrators, administrative managers, association executives, information systems specialists, and Washington representatives); the certified employee benefit specialist program; the certified financial planning program; credit courses; test review courses (for CLEP, LSAT, GMAT, MCAT, and GRE).

The Center is the site of the University's Continuing Education for Women program, which has provided counseling and educational services to women in transition since 1964. More than 16,000 participants have benefited from the Continuing Education for Women programs, which currently include group and individual counseling, a series of special-interest courses focusing on issues confronting women, and three undergraduate certificate programs, which combine academic credit courses with skill-development workshops for supervisory specialists, communication specialists, and social services specialists.

ENGLISH FOR INTERNATIONAL STUDENTS

This is a comprehensive program in English as a foreign language designed to serve members of Washington's international community who wish to improve their command of English through an intensive or semi-intensive study program. Courses offered at various levels of proficiency, covering both oral and written communication, are scheduled in 14-week sessions during the fall and spring semesters and in two 10-week sessions during the summer. Students entering the program take a battery of tests to determine their levels of proficiency for placement in English and academic programs. Registration for the tests is held in advance of course registration at the Office of English for International Students, Academic Center, 801 22nd St., N.W., Suite T604, Washington, D.C. 20052. A $10 testing fee is charged each student. Persons writing from outside the United States and needing a student visa will be considered for an I-20 certificate of eligibility for student visa validation. Those interested in applying for a degree program should see the section entitled "Students from Foreign Institutions" for additional information.

OFFICE OF UNIVERSITY STUDENTS

The Office of University Students (OUS) makes on-campus credit courses available to those who are not currently degree candidates at this

University. Such students, often employed in government or industry, may be taking courses to enhance their career potential or as a matter of personal interest. They may be candidates for higher degrees in other institutions, sent here for special work as part of a graduate program. They may be undergraduates matriculated elsewhere, taking courses for transfer to their own institution.

All courses except those restricted to medical and law students and those in the Departments of Accounting, Business Administration, and Management Science are open to nondegree students, provided they have sufficient preparation as determined by the academic departments. Students wishing to take engineering and applied science courses should consult the School of Engineering and Applied Science *Bulletin*.

Registration in a given course may be denied OUS students when space is needed for degree candidates. OUS students are not eligible to register for thesis or dissertation research. OUS requires a minimum registration of three semester hours per semester or session, except in special circumstances.

Entrance Requirements*

An academic background appropriate for the program of studies contemplated is required. In addition, the applicant who has previously attended this or another college or university must be in good standing at that institution. An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission for one calendar year after the effective date of the suspension. An applicant who has been denied admission elsewhere within this University may be considered for admission through OUS upon recommendation of the appropriate department and school or college.

Applications for admission through OUS for a fall or spring semester must be received in the Office of Admissions no later than the Friday before the first day of registration (see the Calendar, pages 5-7). Applications for admission for the summer should be submitted at least two working days prior to registration day. In both cases, however, applicants are urged to apply earlier. There is no application fee.

Regulations

Regulations concerning admission, registration, fees and finances are stated on pages 20-33; other University regulations, on pages 46-53.

Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance (see page 46) and withdrawal (see page 48).

The following specifically apply to all students registered through OUS:

Last day to add a class for credit—end of second week of classes.

Last day to drop a class for credit or to withdraw from the University—end of the seventh week of classes.

Equivalent amounts of time apply to the summer sessions.

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* For admission requirements for students from foreign institutions, see pages 25-26.

ACADEMIC WORK LOAD

For OUS students, the normal academic work load during the regular academic year is not more than 10 semester hours for a student employed more than 20 hours per week and not more than 18 semester hours for a full-time student. During the summer a student may take a maximum of two courses during any one session. Exceptions to these limits must be approved by the dean.

SCHOLARSHIP REQUIREMENTS

A student who fails to maintain the scholarship requirements of OUS may be dismissed from the University. A statement of scholarship requirements is available in the office of the dean.

All grades received in OUS remain on the record; scholarship requirements are based on the total record.

Grades—See page 46. There is no limitation on the number of courses that may be taken on a pass/no pass basis in OUS; however there may be a limit on the number that can be transferred to fulfill degree requirements.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 47.

Removing an Incomplete—The instructor normally sets a period (maximum of one year) within which the uncompleted work must be made up. An Incomplete which is not removed within one calendar year remains as a grade of *I* on the student's record.

CHANGE IN PROGRAM OF STUDIES

Change within the Office of University Students—A student may not change or drop courses (see "Withdrawal," page 48) or change status to that of auditor except with the approval of the dean.

Transfer within the University—Transfer to or from OUS may be made only with the approval of the deans concerned.

Application for transfer to degree candidacy will be considered only after the completion of at least one semester in OUS or upon request from the college or school to which the student is seeking admission.

Students wishing to transfer to degree candidacy must meet the conditions of the college or school to which they are applying. It is the responsibility of the student to consult the relevant degree-granting college or school concerning all conditions to be met and the amount of work transferable.

COLLEGE PROGRAM FOR SECONDARY SCHOOL STUDENTS

The George Washington University College Program for Secondary School Students provides the promising high-school student an opportunity to take fully accredited college courses along with college students.

To take advantage of the University's unique location in the nation's capital, a diversified cultural and recreational program is arranged. Opportunities for observation, study, service, and recreation are limited only by the student's time, energy, and imagination.

A wide variety of the regular course offerings are available on a full-time basis during the Summer Sessions and on a part-time basis throughout the academic year to eligible students. During the summer program, students from outside of the Washington area must reside in an on-campus, University residence hall. Local residents may choose to stay in on-campus housing during the summer; however, housing is not available for part-time, commuting students who are taking college course work concurrently with their high school program during the fall and spring semesters.

Scholarships—For the summer programs, students with outstanding academic records and excellent standardized test scores will be considered automatically for full-tuition scholarships. Tuition awards are also made available to superior students enrolled during the fall and spring semesters. Because the awards are based on academic merit rather than financial need, only the program application is required for consideration, though the Admissions Coordinator may request updated test scores and or high school transcripts. While the scholarship will cover tuition costs and the recreational program in the summer, students must pay for room and board, incidental fees, and personal expenses.

For further information and an application, please write the College Program for Secondary School Students, Office of Admissions, George Washington University, Washington, D.C. 20052.

SUMMER SESSIONS OFFICE

During the summer, Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Government and Business Administration, the School of Public and International Affairs, the School of Engineering and Applied Science, and the School of Medicine and Health Sciences offer courses in one three-week session and two five-week sessions. The National Law Center offers courses in two six-week sessions and one three-week session; the School of Education and Human Development offers courses in three- and six-week sessions. The University also offers special programs during the summer which are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the spring semester may register for the following Summer Sessions without special application. All others must apply for admission or readmission. No application fee is charged nondegree students. Those who wish degree status may seek admission from the appropriate college or school within the University. Those who do not wish to work toward a degree at the University may apply through the Office of University Students, and are subject to its entrance requirements and regulations stated above.

For a complete statement concerning summer term work, see the *Summer Sessions Schedule of Classes.*

THE CENTER FOR TELECOMMUNICATIONS STUDIES

The Center for Telecommunications Studies is a multidisciplinary unit with primary functions involving research, reference/referral, and con-

ferences and workshops. The Center defines telecommunications to include transmission of information over distances by various electronic technologies, including public and commercial broadcasting, cable TV, the national switched common carrier network and local loops, microwave, communications satellite carriers, teletext-videotex, consumer audio and video services and products, electronic mail, mobile communications service of all kinds, and the communications (data) interface. Within this broad subject area, the Center provides general support for the University's several graduate programs in telecommunications, acting as a central point of contact for faculty, the government policy community, and corporate planners in communications.

The Center is located in Building H, 2000 G Street, N.W.

GWU TELEVISION

State-of-the-art production and broadcasting capabilities are available on campus through the GWU television station. Operating from studios located in the Academic Center, 801 22nd Street, N.W., the instructional television system will air live and or videotaped broadcasts on four ITFS channels. Initial goals of GWU Television are: to extend educational opportunities off campus to meet broad or specialized community needs; to provide University faculty with the opportunity to create original educational materials for the increased benefit of students; and to provide the community with convenient facilities for various production services.

NONCREDIT COURSES AND PROGRAMS

In addition to the noncredit offerings of the Center for Continuing Education in Washington, the University also sponsors the noncredit continuing education activities of the School of Government and Business Administration, the School of Engineering and Applied Science (through its Continuing Engineering Education Program), and the School of Education and Human Development (through its Center for Research and Services).

DIVISION OF EXPERIMENTAL PROGRAMS

Director R.S. French
Assistant Directors P. Aron, H.B. Wagner

The Division of Experimental Programs has as its function the support of curricular experimentation and development throughout the University. This curricular development program has three objectives: (1) cooperation among the academic divisions of the University in the development and sponsorship of new courses and programs; (2) experimentation with new ways of teaching and learning; and (3) a more direct relationship between campus and off-campus resources and interests. In pursuit of

these objectives the Division awards faculty fellowships for interdisciplinary research, sponsors student-faculty societies for interdisciplinary education, and regularly organizes regional conferences on educational issues.

Under the auspices of the Division of Experimental Programs, students, faculty, and administrators throughout the University are involved in the planning, teaching, and evaluating of experimental courses and degree programs. Many curricular experiments which receive financial support through the Division of Experimental Programs are sponsored by other academic units of the University, e.g., the 700 Series of Courses in General and Interdisciplinary Studies.

The Division administers the Service-Learning Program which integrates off-campus, pre-professional work placements with classroom seminars. Students in the program are placed in community groups, research organizations, or governmental agencies. Assignments are arranged by means of a formal agreement among the student, the program, and the off-campus placement. Instructors in the seminars are members of the faculty in one of the professional schools of the University. The Division also sponsors residential courses in which students enrolled in the same class live together in designated areas of University housing.

The Division of Experimental Programs is charged with mobilizing academic resources throughout the University that can appropriately address needs in the Washington metropolitan community. Selected students receive stipends for services to residents and work with community organizations or city agencies.

The Division administers the Center for Washington Area Studies, which coordinates Washington-related research and teaching conducted by numerous academic departments and programs throughout the University. Through the Center the Division supports an annual conference on local history, publishes a monograph series (*GW Washington Studies*), and sponsors each academic year the Banneker Visiting Professor of Washington Studies.

ASSOCIATES

William H. Becker, *Faculty Associate for Business Studies*
James Deakin, *Faculty Associate for Political Communications Studies*
Howard F. Gillette, *Faculty Associate for Washington Area Studies*
Gail J. Povar, *Faculty Associate for Humanities and Medicine*
Colin M. Turnbull, *Faculty Associate for Community Studies*

STEERING COMMITTEE

Harold Frederick Bright, *Provost and Vice President for Academic Affairs, Chairman*
Lawrence Thompson Bowles, *Dean of the Medical Center, for Academic Affairs*
Carl James Lange, *Professor of Psychology; Vice President for Administration and Research*
Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
John Mortimer Logsdon, *Professor of Public Affairs and Political Science*

Ralph Clarke Nash, *Professor of Law*
Judith Ann Abrams Plotz, *Associate Professor of English*
Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*

POLICY STUDIES AND SPECIAL PROJECTS

Vice President for Policy Studies and Special Projects L.H. Mayo

The Vice President for Policy Studies and Special Projects is responsible to the President of the University for developing an interdisciplinary capability for analyzing national policy issues. There is involvement with the Consortium universities and with foundations, federal agencies, industry, and other organizations which interact with the governmental process.

The office serves the University as a locus for discussion and as an advisory resource on interdepartmental and interdisciplinary research related to the analysis of public policies, and on curricula pertaining to broad social or environmental problems.

The University has sustained an institutional commitment, in terms of faculty recruitment and program emphasis, to issue-oriented policy analysis as a major focus of teaching and research activities. The result of thirteen years of development is a significant, institutional capability for comprehensive analysis of complex policy issues. Major programs oriented to public policy and governmental functions, which come within the ambit of this office, are described below.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

Director L.H. Mayo
Executive Associate Pamela B. Smith

The Program's primary objective is the continuing development of a University-wide policy research capability related to problems stemming from the impact of technological change on the processes, values, and institutions of society. The Program provides a neutral forum for consideration of these policy issues—whether in a retrospective, current, or prospective context—and provides an advisory and research resource for policy makers in the public and private sectors.

The Program's primary components are:

1. *The Technology Assessment Group*—The Program has been closely involved with the evolution of the concept of Technology Assessment (TA), which has become federally institutionalized in the Congressional Office of Technology Assessment. Much of the early work of the Program consisted of theoretical, methodological, institutional, and historical

studies. Since 1973, however, the TA Group has carried out studies in a variety of subject areas including transportation, energy, community development, environmental noise, communications, and governmental structure and process, under contracts or grants from most of the major federal agencies.

2. *The Graduate Program in Science, Technology, and Public Policy*—This Master's degree program—co-sponsored by the Program of Policy Studies and the School of Public and International Affairs (SPIA)—combines graduate training in science policy analysis with major research undertakings. The program is the largest degree-granting science policy program in the United States. Admissions information is contained in the SPIA section of this *Bulletin*.

The Program of Policy Studies normally has between 10 and 15 professionals and many students working on several projects, most of which are problem-oriented and interdisciplinary in nature. Members of the faculty, graduate students, members of governmental agencies, and special consultants are regularly involved in our studies. To date the Program has performed upwards of 100 policy studies and has published over 200 reports, monographs, books, and special papers which have been distributed to professionals and institutions throughout the world. Funding for the Program's activities has come from a variety of sources: the University; federal agencies, including DOE, EPA, HHS, HUD, NASA, Commerce, OTA, and NSF; and private foundations, including The Ford Foundation.

Professional Associates

Director Louis H. Mayo, *Vice President for Policy Studies and Special Projects; Professor of Law*

James M. Brown, *Senior Staff Scientist; Professor of Law*

Thomas Dietz, *Assistant Professor of Sociology (Environmental Policy)*

Peter R. Huessy, *Research Associate (Policy Analysis and International Affairs)*

Charles V. Kidd, *Senior Staff Scientist (Public Affairs)*

Samuel Robert Lichter, *Assistant Professor of Political Science*

John M. Logsdon, *Research Scientist; Director, Graduate Program in Science, Technology, and Public Policy; Professor of Public Affairs and Political Science*

Joseph Mintzes, *Consultant (International Affairs)*

Henry R. Nau, *Graduate Program in Science, Technology, and Public Policy; Associate Professor of Political Science and International Affairs*

Herman Pollack, *Research Professor of International Affairs (Political Science)*

Robert W. Rycroft, *Deputy Director, Graduate Program in Science, Technology, and Public Policy; Assistant Professor of Public Affairs and Political Science*

J. Eleonora Sabadell, *Consultant (Natural Resources Policy)*

Barbara F. Sachs, *Consultant (Law)*

Charles L. Trozzo, *Consultant (Economics)*

Anne C. Webb, *Research Associate (Policy Analysis and International Affairs)*

NATIONAL HEALTH POLICY FORUM

Director Judith Miller Jones
Associate Director Marion Ein

The National Health Policy Forum assists professional staff members employed by the executive and legislative branches of the federal government to gain a better understanding of health delivery practices and related current public policy issues. Its purpose is to facilitate communication between Washington health policy makers and experts in the field who represent the academic community, labor, industry, the health professions, and consumer groups. Exposure to problems and issues facing the entire country is gained primarily through sequenced evening discussions or workshops and, where appropriate, site visits. Although attendance is primarily limited to Congressional aides and top-level health staff from the many government agencies involved in health, George Washington University students and faculty can be accommodated on a space-available basis.

SPONSORED RESEARCH

Vice President for Administration and Research C.J. Lange

These special programs were established for the specific purpose of considering, in an academic atmosphere, problems proposed by the individual projects or submitted by the sponsoring agency. Cooperation between these programs and the various departments of instruction is as close as the nature and needs of the programs and departments will permit.

CENTER FOR SOCIAL POLICY STUDIES

Director Sar Levitan

The Center for Social Policy Studies is devoted to the evaluation of federally-supported manpower, antipoverty and related programs. The Center is financed by a grant from the Ford Foundation and offers, in conjunction with the Department of Economics, graduate courses in labor economics and social policy.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) CLEARINGHOUSE ON HIGHER EDUCATION

Director Jonathan Fife

The Educational Resources Information Center (ERIC) Clearinghouse on Higher Education, established in the fall of 1968, is supported by the National Institute of Education. The Clearinghouse is responsible for the

acquisition, evaluation, abstracting, indexing and dissemination of research reports and other documents dealing with problems and issues in higher education, prepares state-of-the-art and review papers related to higher education and responds to individual inquiries concerned with higher education.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

Director W.H. Marlow

The Institute for Management Science and Engineering provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. Through its Program in Logistics, the Institute performs research leading to the development of a science in logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts.

NATURAL RESOURCES POLICY CENTER

Director Mary Holman

The Natural Resources Policy Center was established in September, 1965, to sponsor faculty and student research in the area of natural resources and environmental quality; to develop and undertake activities that promote undergraduate and graduate education; and to train employees of public resource agencies. The program of the Center focuses particularly on increasing the contribution of the social sciences to the solution of contemporary problems relating to the management and development of natural resources. The Natural Resources Policy Center, which provides a focus on natural resource and environmental quality problems and issues, is an integral part of the Department of Economics in both the design of its research program and its courses.

SOCIAL RESEARCH GROUP

Director Ira Cisin
Associate Director Philip W. Wirtz

The Social Research Group conducts surveys and experiments with concentration on basic research underlying an approach to the solution of social problems.

COURSES OF INSTRUCTION

The following pages contain listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors and carry the same amount of credit.

EXPLANATION OF COURSE NUMBERS

First-group courses—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accounting courses numbered 101-200 may not be taken for graduate credit.

Third-group courses—Courses numbered from 201 to 300 in the Graduate School of Arts and Sciences and the School of Government and Business Administration, and courses numbered 201 to 400 in the School of Education and Human Development, are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Non-degree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

Fourth-group courses—Courses numbered 301 to 400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301 to 400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 401 to 500, are limited to graduate students with master's degrees from accredited institutions.

Fifth-group courses—Courses numbered 701 and 721 represent an ongoing program of curriculum innovation at GW. The 701 number is used to

designate experimental courses taught by individual faculty members. The 721 number designates innovative interdepartmental courses. Courses numbered in the 770s are taught by scholars who hold appointments as University Professors. The 700 numbers do not indicate the level of difficulty. Courses in this series range from freshman-level offerings to classes designed for seniors and graduate students. Unless the course description in the *Schedule of Classes* indicates that there are prerequisites or that an interview with the instructor is required prior to registration, 700 courses are open to all interested students, subject to their advisor's approval and the rules of the respective colleges.

KEY TO ABBREVIATIONS

The following abbreviations are used for course designations:

Acct	Accounting
AdSc	Administrative Science
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BISc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
E&RP	Environmental and Resource Policy
EnHe	Environmental Health
Envr	Environmental Studies
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Hmn	Humanities
Idis	Interdisciplinary Courses
Japn	Italian
Ital	Japanese
Jour	Journalism
Kor	Korean
Law	Law
Libr	Library
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opht	Ophthalmology
Orth	Orthopaedic Surgery
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PCm	Political Communications
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology

PAd	Public Administration
PPol	Public Policy
RSci	Radiological Sciences
Rad	Radiology
RPol	Regulatory Policy
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunications Policy
Univ	University
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the *Summer Sessions Schedule of Classes* for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

ACCOUNTING

Professors E.J.B. Lewis, A.J. Mastro *(Chairman)*, F.C. Kurtz, C.M. Paik, M.G. Gallagher, J. Hilmy
Professorial Lecturers F.W. Segel, S.M. Farag
Assistant Professors F.J. Rooney, D.R. Sheldon, B.E. Committe, G.C. Wooding
Assistant Professorial Lecturers P. Ben Ezra, M.L. Laine
Instructor G.B. Wright

The School of Government and Business Administration offers programs of study in accountancy leading to the degrees of Bachelor of Accountancy, Master of Accountancy, and Doctor of Business Administration.

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 200 and above may not be taken for undergraduate credit.

First Group

51–52 **Introductory Accounting** (3–3) Kurtz
Basic understanding of accounting concepts, procedures, analyses and reports; the accounting measurement and communications of significant economic and financial data. Prerequisite: sophomore status. Acct 51 is prerequisite to Acct 52. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 51. (Acct 51 and 52—fall and spring)

Second Group

101 **Cost and Budgetary Control** (3) Sheldon
Cost behavior and volume-profit relationships, responsibility accounting, standard costs, cost structures for control and decision making, relevant costs, cost concepts and variance analyses. Prerequisite: Acct 51–52 and junior status. Students who have received credit for Acct 193 cannot receive credit for Acct 101. (Spring)

111 **Financial Statement Analysis** (3) Hilmy
Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 51–52. (Fall and spring)

121 **Intermediate Accounting** (3) Hilmy
In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 51–52 and junior status. (Fall)

132 **Accounting Theory** (3) Hilmy
Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions to accounting literature. Prerequisite: Acct 121 and senior status. (Spring)

141 **Governmental Accounting** (3) Lewis
Appropriation, encumbrance, and fund accounting for governmental and institutional entities. Prerequisite: Acct 51–52. (Fall)

151 **Business Law for Accountants I** (3) Rooney
An introduction to business law concepts for the professional accountant. Contracts, bailments, commercial paper, secured transactions, property, agency, etc., with concern for professional accounting certification; the interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Acct 51–52 and junior status. (Fall)

152 **Business Law for Accountants II** (3) Rooney
A broadening of business law concepts—partnerships, corporations, federal antitrust, labor, and securities. Legislation and litigation of the professional accountant's liability as an auditor and tax advisor. The interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Acct 151 and senior status. (Spring)

161 **Federal Income Taxation: Individuals** (3) Rooney
A study of federal income tax concepts with primary emphasis on individuals. Prerequisite: Acct 51-52 and junior status. (Fall)

162 **Federal Income Taxation: Corporations, Partnerships, Estates, and Trusts** (3) Rooney
Federal income tax concepts applicable to corporations, partnerships,

estates and trusts; tax research and planning. Prerequisite: Acct 161. (Spring)

171 **Auditing** (3) Kurtz
Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, audit evidence, professional and legal responsibility, and audit of E.D.P. systems. Prerequisite: Acct 121 and senior status. (Fall)

181 **Accounting Systems** (3) Segel
Data processing considerations in the design and operation of accounting systems. Principles of internal control applicable to manual and automated accounting systems. Prerequisite: Acct 101, 121, and senior status. (Fall)

190 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. Prerequisite: Department approval.

191 **Advanced Accounting** (3) Hilmy
Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Acct 121 and junior status. (Spring)

193 **Business Budgeting** (3) Lewis
Principles and procedures in the development, installation, and operation of a system of budgetary control to aid management. Prerequisite: Acct 51–52. Students who have received credit for Acct 101 cannot receive credit for Acct 193. (Fall and spring)

199 **Accounting Practice Internship** (3) Mastro
Concepts, procedures and standards of auditing practice obtained as an intern with a firm or agency. Prerequisite: 15 semester hours of accounting courses (including a course in auditing), senior status, and approval of the chairman of the department. (Spring)

Third Group

201 **Financial Accounting** (3) Kurtz
The role of accounting in the decision-making process of external parties; the understanding, interpretation, and implementation of financial accounting. (Course equivalent: a similar graduate financial accounting course, or Acct 51–52, or two similar undergraduate courses.) (Fall and spring)

211 **Business Law for Accountants** (3) Rooney
A study of the legal process and of the principles and precepts of business law; corporations, partnerships, property, trusts, wills, and the legal liability of the accountant. Prerequisite: Master of Accountancy status. (Fall)

220 **Management Accounting** (3) Paik
The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation decisions in the organization. Prerequisite: Acct 201. (Fall and spring)

221 **Cost Analysis** (3) Sheldon
An advanced cost accounting course with emphasis on comparative costs, quantitative techniques in cost analysis, and managerial accounting reporting systems. Prerequisite: Master of Accountancy status. (Spring)

225 **Accounting Theory** (3) Segel
A critical understanding of the Financial Accounting Standards Board

Pronouncements (Standards) and the Security and Exchange Commission–Accounting Series Releases. Prerequisite: Master of Accountancy status. (Fall)

242 **Business Income Taxation** (3) Gallagher
Federal tax concepts applicable to individuals, partnerships, fiduciaries, and corporations; emphasis on recognition of tax consequences attached to common business transactions, and tax planning. Not open to Master of Accountancy candidates. (Fall and spring)

251 **Accounting for Multinational Corporations** (3) Hilmy
A study of international accounting standards with emphasis on accounting for foreign conversion requirements compatible with domestic accounting consolidation standards. Prerequisite: Acct 201 and 220. (Fall)

255 **Consolidations** (3) Hilmy
Corporate consolidation concepts, policies, and procedures, including FASB, SEC, and AICPA Pronouncements on business combinations. Structure analysis of combined and consolidated financial statements. Prerequisite: Master of Accountancy status. (Fall)

261 **Federal Income Taxation of Individuals** (3) Gallagher
A study of federal income taxation of individuals covering gross income, deductions and credits, sales, and other disposition of property, capital gains and losses, and timing. Prerequisite: Master of Accountancy status. (Fall)

262 **Federal Income Taxation of Partnerships** (3) Rooney
Federal income taxation of partnerships; formation, operation, distributions, and transfer of partnership interests. Prerequisite: Master of Accountancy status and Acct 261. (Spring)

263 **Federal Income Taxation of Corporations** (3) Gallagher
A study of federal income taxation of corporations, covering capital structure, distributions not in and in complete liquidation, and corporate accumulations. Prerequisite: Master of Accountancy status and Acct 261. (Spring)

264 **Federal Taxation of Estates, Gifts, and Trusts** (3) Gallagher
A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Master of Accountancy status and Acct 261. (Spring)

275 **Contemporary Auditing Theory and Procedures** (3) Kurtz
Study of advanced independent (external) and internal auditing concepts: application of statistical sampling to auditing, audit of electronic data processing systems. Prerequisite: Master of Accountancy status. (Spring)

276 **Management Planning and Control** (3) Paik
Integrative case study approach to management systems for planning, control, and decisions: value indices for organizational subunits, transfer pricing, contemporary control systems, accounting framework and cycle. Prerequisite: Acct 201 and 220. (Spring)

277 **Accounting and Decision Systems** (3) Paik
Accounting as a basis for economic decision-making by management and investors. Prerequisite: Acct 201 and 220. (Fall)

282 **Accounting Information Systems** (3) Segel
Development and application of accounting system theory, including analysis, design, and implementation. Integration of automatic data processing, accounting systems, and management information systems. Prerequisite: Master of Accountancy status. (Fall)

290 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

297 **Professional Accountancy and Business/Government Policy** (3) Mastro
(Formerly Acct 232)
A study of the development process of professional accounting standards through examination of management operational situations and policy issues. Management policy concerns for alternatives in the selection of accounting standards through case analysis. Prerequisite: Master of Accountancy status. (Spring)

298 **Directed Readings and Research in Accounting** (3) Mastro and Staff

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. The courses are open to other graduate students at the discretion of the department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

391 **Doctoral Seminar in Accounting** (arr.) Sheldon
Reasoning and research in technical areas of accounting; theoretical issues and their application to practice; conceptual themes in professional literature; comparative accounting research analyses. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Mastro and Staff
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Mastro and Staff
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

ADMINISTRATIVE SCIENCE—GRADUATE PROGRAM

Academic Committee: J. Zeidner *(Academic Director)*, J.N. Mosél, R. Clark

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of administrative science. The program has been designed for government and business professionals who wish to increase their administrative competence and career potential. It provides knowledge and skills in the social, behavioral, quantitative, and information sciences.

Master of Arts in the field of administrative science—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. There is no thesis or tool requirement. Psyc 244; Econ 217; Stat 104, 107; and OR 235 *(Analytic Methods for Management Policy I)* constitute the core curriculum. A

student may specialize in Management Information Systems, Human Resources Management, or Applied Organizational Behavior. The Management Information Systems track requires AdSc 201, 202, 203, 204; CSci 222 *(Design of User-Computer Dialogues)* and 230 *(Information Policy)*. The Human Resources Management track requires AdSc 210, 211, 212, 213, 214; Psyc 250; and Econ 243. The requirements for the Applied Organizational Behavior track are Psyc 245, 246, 248, 260; Soc 241; AdSc 215 and 216. All students must pass a Master's Comprehensive Examination.

201 Principles of Management Information Systems (3)
Examination of fundamental issues associated with information systems. The evolution of the "system perspective" from general systems theory. Contemporary information systems as a function of four generations of system analysis techniques. Design and optimization of existing structures and tools for analyzing need for information systems in an organization. Offered as the demand warrants.

202 Management Information Technology I (3)
Principles of design, implementation, evaluation, and modification of management information systems. Emphasis on hardware and software configuration, design strategies and alternatives, and analytical techniques. Introduction to operating systems, control languages, assembler/machine languages, and high-level programming languages. Students will prepare and test several programs. Offered as the demand warrants.

203 Management Information Technology II (3)
Advanced concepts in analysis and development of computer-based information systems. Networks; high-level data structures; effective utilization and management of storage (including "garbage collection" techniques); input/output interfacing strategies; development of telecommunication protocols; principles of performance evaluation and optimization; hardware/software interfaces. Offered as the demand warrants.

204 Management Information Systems Development (3)
Synthesis of organizational and technological aspects of development of information systems. Students will design, develop, implement, and test a computerized management information system. Emphasis on needs assessment, organizational structures as they reflect varying requirements for an information system, and comprehensive evaluation techniques. Offered as the demand warrants.

205 Decision Support Systems (3)
Comparison of existing techniques and tools for assisting management in the decision-making process. Overview of alternative approaches to the management of information and the comparative costs and benefits of each. Analysis of the frameworks with which to organize and synthesize the decision-making process. Hardware and software limitations of alternative approaches. Offered as the demand warrants.

210 Employment Testing: Practices, Policies, and Controversies (3)
The seminar will explore the theory, use, and utility of current quantitative assessment techniques in the work setting. An examination will be made of employment testing and the kinds of criticisms levied against such testing. The social and policy implications, adverse impact, and legal constraints in test use will also be analyzed. Testing in industry, government, and the military, and for licensing purposes, will be highlighted. Offered as the demand warrants.

211 **Psychology of Public Personnel Administration** (3)
The seminar will examine the psychological theory and techniques underlying such personnel functions as selection, training, personnel evaluation, systems evaluation, and labor relations. The impact of the electronic information revolution on management practices, jobs, and individual incentives also will be analyzed. An assessment will be made of the new federal performance-based evaluation system, including the Merit Pay and Senior Executive Systems. Offered as the demand warrants.

212 **Administrative Systems: Theory and Practice** (3)
Examination of significant administrative functions within an integrated systems framework of the employee, the organization, and society. Emphasis on operational problems and strategic planning. Typical areas include needs assessment, goal setting, resource development, labor-management relations, comparable worth, and the law and personnel management. Offered as the demand warrants.

213 **Managerial Leadership, Motivation, and Work** (3)
Examination of managerial behavior and skills in such areas as contract management, group and personal interactions, supervisor–subordinate relationships, conflict management, and labor negotiations. Analysis of relationships of the manager's leadership style, experience, and capabilities to theories of leadership and motivation. Offered as the demand warrants.

214 **Personnel Training and Performance Appraisal Systems** (3)
Training and appraisal of employees for improved productivity. Training topics include development of management training programs, microelectronics applications, and techniques for aiding decision-making skills. Appraisal topics include obtaining dependable criteria, performance measurements, and comparison of merit rating systems. Offered as the demand warrants.

215 **Current Issues in Socio-Technical Systems and Organizational Design** (3)
Socio-technical systems provide a basis for examining the effects on performance of organizational factors. Topics include: design approaches emanating from Europe, Japan, and the U.S.; comparisons of selected job and organizational design approaches, drawing heavily on systems theory with direct focus on the design of the workplace; and the interrelations among jobs, moving toward broader organizational design issues. Offered as the demand warrants.

216 **Theories and Management of Planned Change** (3)
Examination of theories of planned changes of individuals, groups, and organizations, including diffusion of innovation. Perspectives on change include cognitive input, modeling and limitation, participation involvement, expectancy, selective reinforcement, and structural rearrangement. Offered as the demand warrants.

217 **Productivity and Human Performance** (3)
Definitions and measurement of productivity for individuals, teams, and organizations and for jobs that vary from highly structured to unstructured. Techniques that enhance productivity, including job design, training, and motivation. The roles of labor and management in achieving greater productivity. Offered as the demand warrants.

AMERICAN STUDIES PROGRAM

Professors R.H. Walker, Jr., C.C. Mondale, B.M. Mergen *(Director)*
Adjunct Professor F. Gutheim
Professorial Lecturers L. Miller, W.E. Washburn, D. Wigdor
Associate Professors J.O. Horton, H.F. Gillette, Jr., J.M. Vlach
Associate Professorial Lecturer C.R. Field
Assistant Professors P.M. Palmer, M.S. Shapiro
Adjunct Assistant Professors P.J. Cressey, S.R. Crew
Assistant Professorial Lecturer B.G. Carson

Affiliated Programs

David Wigdor (Library of Congress)
Wilcomb E. Washburn (Smithsonian Institution)

Faculty Advisory Committee

C.C. Mondale *(Chairman)*, C.J. Deering, F.S. Grubar, R.L. Humphrey, J. Moreno, O. Seavey, R.P. Sharkey, R.W. Stephens, D.D. Wallace, Jr., A.M. Yezer

American Studies Council

The Council serves the American Studies Program in an advisory capacity. It includes representatives from the student body, the Washington community, the faculty, alumni, and affiliated programs.

Bachelor of Arts with a major in American civilization (field-of-study)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite course—AmCv 71–72. (In preparation for the major field it is recommended that students take the introductory American history course and elect introductory courses in anthropology, art, economics, English, geography and regional science, philosophy, political science, religion, and sociology.)

3. Required courses in the major—(a) 15 semester hours of approved second-group courses in an American civilization core field, including U.S. social history (6 hours), American literature (6 hours), and an interdisciplinary elective (3 hours); (b) 15 semester hours of approved second-group courses in a related discipline or topical area; (c) AmCv 179–80, which must be taken in the senior year.

The major examination required of all seniors must be satisfactorily completed in the final year.

Special Honors will be awarded to students who fulfill the general requirements stated under Regulations and in addition (1) receive grades of *A* in at least half of their courses in the two areas of concentration and (2) receive honors in the major examination.

Two years of a foreign language or adequate preparation in statistics, logic, or linguistics is strongly recommended. Students should consult frequently with an American Civilization advisor.

Master of Arts in the field of American civilization—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in American Civilization or in the subject in which concentration is contemplated.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) AmCv 271–72 (six semester hours), a seminar on

scope and method in American Civilization; (2) 18 additional semester hours in a carefully related pattern, focusing on a concentrated approach to the study of American Civilization; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major emphasis falls; (4) a Master's Comprehensive Examination reflecting the candidate's area of concentration. Special options in the degree program include the following:

1. *A concentration in museum training*—Course emphasis on substantive research in material culture under direction of staff at the Smithsonian Institution. Required: in addition to the general requirements outlined above, AmCv 250. Recommended, but not required: AmCv 352 (advanced research), AmCv 251 (internship), and other related courses offered by the Departments of Anthropology, Art, or Education.

2. *A concentration in historic preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: background in urban history. Required: in addition to the general requirements outlined above, AmCv 277–78. (AmCv 272, however, is not required in this concentration.) Recommended, but not required: additional courses in architectural history, urban and regional planning, and local history.

3. *A concentration in folklife*—Course emphasis on the expressive culture of American folk societies and theories and methods for its evaluation and interpretation. Required: in addition to the general requirements outlined above, AmCv 254, 257. Strongly recommended: additional course work on topics related to folklife such as regionalism, oral history, material culture, vernacular architecture, and social and cultural history.

Master of Arts in the field of museum studies, see Museum Studies.

Doctor of Philosophy in the field of American civilization—This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and/or social sciences as they apply to the understanding of American civilization.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Candidates must pass a General Examination in four areas within three calendar years of matriculation. American cultural history is the only required field. Three other fields may be elected with approval of the advisory committee; one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social or urban history; folklife, literature, art, philosophy, or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution (National Museum of American History, National Portrait Gallery, and National Museum of American Art)—supervised studies including architectural history, decorative arts, ethno-history, historical archaeology, history of science, history of technology, industrial archaeology, material aspects of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

First Group

50 **Washington, D.C.: Culture and Politics** (3) — Gillette and Interdisciplinary Team
(Formerly Hum 40)
Introduction to interdisciplinary methods of studying the contemporary city. Major problems of metropolitan life, past and present, analyzed by faculty and community leaders. Emphasis on experiential team projects. Same as Hist/PSc 50. (Fall)

71–72 **Introduction to American Civilization** (3–3) — Mondale
Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

Second Group

115 **Field Program in Mesoamerican Archaeology and History** (6) — Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Same as Geog 115. Field study in Mexico and Central America. (Summer)

160-61-62 **Studies in American Literature** (3–3–3) — Seavey, Romines, Sten
Same as Engl 160–61–62.

165–66 **Introduction to Folklore** (3–3) — Vlach
History, theory, and methods of folklore. AmCv 165: European and African backgrounds to American folklore. AmCv 166: Folklore and folklife of the United States. Same as Anth 165–66. (Academic year)

167 **Man-Made America: The Old Colonial Scene** (3) — Haskett
Same as Hist 167.

168 **Man-Made America: Views of a New Nation** (3) — Haskett
Same as Hist 168.

173 **Afro-American History** (3) — Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Fall)

174 **Special Topics in Afro-American History** (3) — Horton
Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as Hist 174. (Spring)

177 **Introduction to Historic Preservation** (3) — Gale
Washington, D.C. will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. Same as U&RP 177. (Spring and summer)

179–80 **Proseminar in American Civilization** (3–3) — Mondale
Coordinating course for seniors majoring in American Civilization. (Academic year)

184 **Contemporary American Civilization** (3) — Staff
Examination of the patterns of contemporary American life through study of literature and the arts, and political, social, cultural, and economic trends.

185 **History of Women in America** (3) — DePauw
Same as Hist 185.

186 **U.S. Urban History** (3) — Gillette
History of the American city from colonial foundations to the pres-

ent, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, with attention to implications for public policy and historic preservation. Same as Hist 186. (Fall)

192 **The American Cinema** (3) Mergen
History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. Same as Art/SpDr 192. (Spring and summer)

194 **Introduction to Historical Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Independent Study** (3) Staff
Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring)

197 **Oral History and Interview Techniques** (3) Mergen
Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. Same as Anth/Hist 197. (Spring)

198 **Special Topics in American Studies** (3) Staff
May be repeated for credit provided the topics differs. Admission by permission of instructor.

Third Group

215 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

225 **History of Washington, D.C.** (3) Gillette
The social history of Washington, from village to metropolis, with emphasis through field trips on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Same as Hist 225. (Summer)

254 **Folklore Theory** (3) Vlach
An intellectual history of American folklore research; analysis of particular theories and methods. Same as Anth 254. (Spring)

257 **Seminar: American Folklife** (3) Vlach
Research and discussion on the traditional cultures of various geographical regions of the United States. Theories of regionalism and their relation to the study of folklife and folklore will be considered. Different regions, such as the West, South, or the Chesapeake will be emphasized in different semesters. Same as Anth 257. (Fall)

259 **Topics in American Folklife** (3) Staff
A seminar devoted to a variety of subjects related to folklore and folklife, such as public sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. May be repeated for credit. Same as Anth 259.

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary historical survey of women's work roles and labor force participation, including social prescriptions for and self-perceptions of women, market and technological factors affecting women's work choices, psychological responses to work roles, and familial organization of work duties. Differential attitudes and experiences by class, race, and ethnic groups. (Spring)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Walker
Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American Civilization. (Academic year)

276 **U.S. Architectural History** (3) Staff
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

277–78 **Historic Preservation** (3–3) Gutheim
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Same as Hist 277–78. The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. (Academic year)

289–90 **Seminar: Topics in American Civilization** (3–3) Staff
Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)

295 **Independent Study** (arr.) Staff
Limited to master's candidates. Permission of instructor, in writing, required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

351 **Vernacular Architecture** (3) Staff
Examination of selected regional and ethnic traditions in American building. Survey and field techniques, comparative study of related types of objects, and use of documentary sources. (Spring)

379–80 **Readings in American Cultural History** (3–3) Walker
For students preparing for the Doctor of Philosophy general examination in the field of American Civilization. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff:

Third Group

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Wigdor, Walker
Examination of major themes in American civilization as they relate to the collections of the Library of Congress. Full year course with direct exposure to Library staff and materials. May be taken either as a conventional seminar culminating in a research paper or as preparation for a doctoral reading field: "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Alternate academic years)

Fourth Group

355–56 **Practicum: Advanced Library Research** (3–3)
Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the National Museum of American History and at the National Portrait Gallery, by members of their staffs:

Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen
Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251 **Museum Research and Education** (3) Washburn and Staff
Supervised work and/or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

252–53 **American Decorative Arts** (3–3) Carson
Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made

of wood, clay, glass, metal, and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Miller, Field
Joint offering of the American Studies Program and the Art Department. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit.

285 **Technology, Labor, and American Society** (3) Staff
Selected readings on the interrelations among technology, labor, and society in the United States.

294 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

Fourth Group

352 **Research in Selected Aspects of American Civilization** (3)
Supervised study and/or field work in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. Prerequisite: AmCv 351-52. May be repeated for credit. (Fall and spring)

ANATOMY—DOCTORAL PROGRAM

Professors F.D. Allan, T.N. Johnson, R.S. Snell *(Chairman)*, E.N. Albert, M.J. Koering
Associate Professors K.E. Johnson, F.J. Slaby, R.J. Walsh
Assistant Professors J.M. Rosenstein, R.C. Bohn, K.D. Peusner

Doctor of Philosophy in the field of anatomy—Required: The general requirements stated under the Graduate School of Arts and Sciences. Candidates must also fulfill tool requirements by demonstrating proficiency in two of the following: a language (German, French, or Russian), biostatistics, computer science, or biological instrumentation. There will also be a comprehensive written and oral examination that will cover at least three areas of anatomical studies.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Faculty approval is required for all courses.

202 **Gross Anatomy** (6) Snell and Staff
Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Developmental Anatomy** (1) Staff
Origin and development of human body; emphasis on study of human development in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson
Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13.

205 **Human Microscopic Anatomy** (3) Albert and Staff
Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) Koering
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Same as Phyl 212. Laboratory fee, $25.

221–22 **Seminar** (1–1) K.E. Johnson
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Staff
Variations in humans and factors affecting them; human evolution and racial differences; anatomy and culture of ancient humans. (Spring)

253 **Brain-Tissue Interactions** (1) Walsh, Rosenstein
Interactions of the CNS with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Anat/Phyl 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee, $10. (Spring)

256 **Teratology** (1) Staff
Introduction to teratologic principles and techniques, with emphasis on experimental design. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Transmission Electron Microscopy** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system, with clinical consideration. (Spring)

275 **Advanced Human Embryology** (1) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

277 **Special Topics in Neuroanatomy** (3) Staff
Selected topics regarding the structural and functional organization of the nervous system. May be repeated for credit. (Spring—alternate years)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
The application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANTHROPOLOGY

Professors R.K. Lewis *(Emeritus)*, R.M. Krulfeld, R.L. Humphrey, Jr. *(Chairman)*, C.M. Turnbull
Professorial Lecturers J.L. Angel, A. Franklin
Associate Professors V.K. Golla, S.L. Simons, A.S. Brooks, J.M. Vlach
Associate Professorial Lecturers M.S. Boone, S. Hertz, G. Teleki, Jr., D. Von Endt, M. Yacoob

Assistant Professor C.J. Allen
Adjunct Assistant Professors C.R. Rose, P.J. Cressey
Assistant Professorial Lecturers R.O. Selig, M.G. Crabtree, R.K. Evans
Adjunct Instructor J. Lanouette
Lecturers A.G. Webster, R.N. Rasnake, S.H. Thompson

Bachelor of Arts with a major in anthropology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite course—Anth 1–2.

3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) six to twelve semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.

4. Requirements for the major—24 to 36 semester hours in second-group anthropology courses, including Anth 101 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s), linguistics (161, 162, 168, or 169), ethnology (courses numbered in the 170s), and physical anthropology or archaeology (courses numbered in the 180s). Students intending to pursue a graduate degree in anthropology should take Anth 157 and at least one course each in archaeology and physical anthropology. Qualified seniors may enroll in 200-level courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archaeological field school credit may be accepted and applied toward the major, if approved by the department, and majors are encouraged to participate in such summer programs. Opportunities also exist for field and laboratory research during the academic year, both within the department and elsewhere in the Washington area. Credit for such work (not to exceed one-quarter of the student's total second-group credit hours in anthropology) may be granted through registration in Anth 195. Seniors in anthropology are urged to enroll in Anth 198, *Senior Seminar;* candidates for graduation with Special Honors must register in Anth 198 or for 3 semester hours of Anth 195, *Undergraduate Research,* and write a paper of special distinction arising out of a program of directed reading or research.

Bachelor of Arts with a major in classical archaeology and anthropology (departmental)—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Required courses in other areas: six semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field-work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas

71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Minor in general anthropology—21 credit hours are required, including Anth 1–2, 101, and four additional semester courses in anthropology, no more than two of which may be taken in the same subdiscipline. (For the purposes of this minor the department's second-group courses may be divided into subdisciplines as follows: biological anthropology—Anth 186, 187, and 188; archeology—Anth 180, 182, 183, 184, 185, 190, and 194; anthropological linguistics—Anth 161, 162, 168, and 169; socio-cultural anthropology—all other second-group courses, with the exception of Anth 195, 196, and 198, in which the topic is variable.)

Minor in archaeology—18 credit hours are required, including Anth 1 and 180; three courses chosen from Anth 182, 183, 184, 185, 190, and 194; an approved field or research course or a fourth course chosen from the preceding list.

Minor in biological anthropology—15 to 18 credit hours are required, including Anth 1, 186, 187, and 188; an approved field or research course or an approved course or course sequence in a related field (including biological sciences, geology, psychology, statistics, and certain other disciplines).

Minor in socio-cultural anthropology—18 credit hours are required, including Anth 2 and 101; one course in ethnography (Anth 170–179); Anth 151 or 152; Anth 156 or 157; one course chosen from Anth 150, 153, 155, 158, or 159.

Minor in cross-cultural communication—18 credit hours are required, including Anth 2, 161, 162; Anth 150 or 159; one course in ethnography (Anth 170–179); one course chosen from Anth 153, 155, 158, 163, 165, or 168. Psyc 115 is recommended.

Master of Arts in the field of anthropology—Prerequisite: a bachelor's degree; a major in anthropology is preferred but not mandatory. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archaeology, and physical anthropology. Students with less background in anthropology may be admitted, but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. *General degree*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first 24 semester hours of graduate course work. A reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A tool course in statistics, computer programming, remote sensing, or a similar technical field may be substituted for the foreign language reading examination, if approved by the department. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work, and must include from 12 to 15 semester hours of work in museum-related courses, 6 semester hours of which may be in an internship. In addition to the tool options described above, museum training students may substitute for the foreign

language reading examination an appropriate course in chemistry or photography, if approved by the department. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropology, are advised to apply to the Master's program in museum studies (see Museum Studies).

3. *With a concentration in development*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 36-credit-hour non-thesis program, including 6 to 9 hours in development anthropology (Anth 220, 221, 222), 18 to 21 hours in other anthropology courses, and 6 to 9 hours in economics and economic development. In some circumstances a thesis may be allowed. The program is designed to improve the student's understanding of complex development problems such as economic change, population, health, education, migration, and ecology within an anthropological framework. A limited number of internships will be available at public and private development agencies in the Washington area.

4. *With a concentration in folklife*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 30-credit-hour thesis program consisting of 24 hours of anthropology, including 6 hours of folklore core courses (Anth AmCv 254 and 257). In some circumstances a 36-credit-hour non-thesis program may be allowed.

Course accessibility: Anth 115, 152, 161, 162, 165–66, 168, 169, 180, 182, 185, and 215 may be taken without anthropology course prerequisites: Anth 1 is prerequisite to Anth 186, 187, and 188; Anth 1 or 180 is prerequisite to Anth 183-84; Anth 1 and 2 are prerequisite to Anth 101; Anth 2 or the permission of the instructor is required for all other second-group courses.

First Group

1–2 **Introductory Anthropology** (3–3) Staff
Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior. (Anth 1 and 2—fall and spring)

Second Group

101 **Survey of Anthropological Theory** (3) Allen, Krulfeld, Golla
The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. (Fall)

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Same as Geog 115. Field study in Mexico and Central America. (Summer)

150 **Comparative Value Systems** (3) Krulfeld
World views, conceptual systems, and value orientations of representative cultures throughout the world.

151 **Primitive Economics** (3) Krulfeld
Comparative study of various economic organizations, including hunters and gatherers, herders, and cultivators. (Fall, odd years)

152 **Man, Culture, and Environment** (3) Humphrey
Basic principles of cultural ecology. Human interaction with the

ecosystem both past and present; emphasis on the application of anthropological precepts to current environmental problems.

153 **Psychological Anthropology** (3) Simons
Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. (Spring)

155 **Anthropological Approaches to Religion** (3) Simons, Allen, Turnbull
Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. Same as Rel 155. (Spring)

156 **Comparative Political and Legal Systems** (3) Hertz, Simons
Comparative analysis of political systems, including bands, tribes, chiefdoms, and states; political processes such as factionalism, styles of leadership, and political ritual; primitive warfare; law. (Spring)

157 **Primitive Social Organization** (3) Simons, Hertz
Comparative analysis of social patterns and roles in kinship and economic and political organization. Emphasis on preliterate societies. (Fall)

158 **Art and Culture** (3) Krulfeld, Humphrey, Allen
The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production. (Fall)

159 **Symbolic Anthropology** (3) Allen
The study of culture through the analysis of symbolic systems including myth, cosmology, folklore, art, ritual, political symbolism, and the symbolic study of kinship. (Fall, odd years)

161 **Language and Culture** (3) Golla, Lanouette
Varieties of linguistic structure; the interrelationship of language and culture; the origin and evolution of human language; cultural and social implications of literacy. (Fall)

162 **Language and Society** (3) Golla
Linguistic variation and change; social and political correlates of linguistic differences; language in history. (Spring)

163 **Anthropology of Visual Communication** (3) Staff
Still and motion picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Material fee, $15.

165–66 **Introduction to Folklore** (3–3) Vlach
History, theory, and methods of folklore. Anth 165: European and African backgrounds to American folklore. Anth 166: Folklore and folklife of the United States. Same as AmCv 165–66. (Academic year)

168 **Methods of Linguistic Analysis** (3) Golla
Phonetics, grammatical analysis, principles of lexicography, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall)

169 **Intensive Study of a Language** (3) Golla
Analytic study of a selected language, ordinarily one not frequently studied in a university context (such as an American Indian language), as an illustration of the methods of anthropological linguistics. Prerequisite: Anth 168. (Spring or summer)

170 **Cultures of the Caribbean** (3) Lewis
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. (Summer)

171 **Native Peoples of North America** (3) Simons, Humphrey
Comparative study of Indian groups representative of each of the continent's culture areas. (Fall)

172 **Cultures of South America** (3) Allen
Comparative study of native American, Iberian, and African cultures of South America, and their interactions. Emphasis on world view, interethnic relations, and culture change. (Fall)

173 **Cultures of the Pacific** (3) Lewis
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. (Fall, odd years)

175 **Topics in Asian and Circumpolar Ethnography** (3) Humphrey, Krulfeld, and Staff
Intensive, integrated study of a selected culture area in or around Asia (including Circumpolar regions). Specific area to be announced in the *Schedule of Classes*. May be repeated for credit.

177 **Cultures of the Near East** (3) Lewis
Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East; emphasis on the Arab world. (Spring)

178 **Cultures of Africa** (3) Lewis, Hertz, Turnbull
Comparative examination of the history, cultural development, and contemporary problems of sub-Saharan African cultures.

180 **General Archaeology** (3) Humphrey, Brooks, Evans
Field and laboratory methodology in archaeology: stratigraphy, dating techniques, chronological systems and their implications; a brief survey of world prehistory.

182 **New World Archaeology** (3) Humphrey
Introduction to archaeological methodology, theory, and survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. (Spring)

183–84 **Old World Prehistory** (3–3) Brooks, Evans
Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. (Academic year)

185 **Latin American Archaeology** (3) Humphrey, Allen
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Meso-America in odd years. May be repeated for credit.

186 **Physical Anthropology of Modern Man** (3) Angel
Individual and social biology, methods, and techniques. Genetic, cultural, and ecologic backgrounds of individual and population variation: micro-evolution, growth, paleodemography, paleopathology, forensic identification, techniques. (Spring)

187 **Introduction to Hominid Evolution** (3) Brooks
The fossil record of hominid evolution considered in the light of evolutionary theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. (Spring, even years)

188 **Primatology** (3) Brooks, Teleki, Thompson
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. (Fall)

190 **Ethnohistory** (3) Allen, Humphrey
Reconstruction of the history of a selected preliterate society through

the analysis of historical documents, oral traditions, archaeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*. Same as Hist 190.

191 **Anthropology, Drama, and the Human Experience** (3) Turnbull, Garner

A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Offered jointly with the Speech and Drama Department.

194 **Introduction to Historical Archaeology** (3) Cressey

Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Undergraduate Research** (arr.) Staff

Individual research problems to be arranged with a member of the faculty. May be repeated for credit.

196 **Special Topics in Anthropology** (3) Staff

Courses offered by visiting faculty; experimental offerings. Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

197 **Oral History and Interview Techniques** (3) Mergen

Same as AmCv/Hist 197.

198 **Senior Seminar** (3)

Study and discussion of selected major works in anthropology. Prerequisite: Anth 101 and senior standing in anthropology.

199 **Techniques of Field Research** (3) Turnbull

Training in the development of skills necessary for different field situations, urban and rural, at home and abroad, in developing techniques of observation, participation, and documentation, as well as skills in handling practical field situations and problems. Intended primarily for those intending to do field research in the United States or abroad but useful to anyone likely to be living or working in a foreign culture.

200 **Methods in Socio-Cultural Anthropology** (3) Krulfeld, Turnbull

Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. (Spring)

Third Group

201 **Proseminar: Biological Anthropology** (3) Brooks

Theories, methods and current issues in the various subdisciplines of biological anthropology. (Spring)

202 **Proseminar: Socio-Cultural Anthropology** Krulfeld, Simons

Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)

203 **Proseminar: Anthropological Linguistics** (3) Golla

Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)

204 **Proseminar: Method and Theory in Archaeology** (3) Humphrey, Brooks

Survey of the most recent archaeological techniques and theoretical

approaches to reconstructing and interpreting the cultures of the past. (Fall)

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Von Endt
Joint offering of the Anthropology and Art Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of instructor. (Fall)

215 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

220 **The Anthropology of Development** (3) Krulfeld
The role of anthropology in development, including social factors crucial to the understanding and resolution of problems in Third World societies (including rural social systems, ideologies, economic change, ecology, women's roles, nutrition, population, and migration). The potential role of anthropology in planning, feasibility studies, and implementation of development projects. (Fall)

221 **Key Variables in the Development Process** (3) Yacoob
Major factors required for anthropologists' development work in the areas of population, education, agriculture, irrigation, forestry, nutrition, health care, migration and resettlement, marketing, and communications. Isolation and study of the major variables and processes in each area to aid in successful planning, feasibility study, implementation and evaluation. (Spring)

222 **Issues in Development** (3) Yacoob
Topic to be announced in the *Schedule of Classes*.

254 **Folklore Theory** (3) Vlach
An intellectual history of American folklore research; analysis of particular theories and methods. Same as AmCv 254. (Spring)

255–56 **Anthropology for Teachers** (4–4) Lanouette and Staff
Examination of current research, innovative classroom techniques and materials. Sessions with anthropologists at museums, laboratories, and zoos. Designed for middle and secondary school social science and science teachers. Admission by special application. May not be taken for credit by M.A. candidates in anthropology. (Academic year)

257 **Seminar: American Folklife** (3) Vlach
Research on and discussion of the traditional cultures of various geographical regions of the United States. Theories of regionalism and their relation to the study of folklife and folklore will be considered. Different regions, such as the West, South, or the Chesapeake will be emphasized in different semesters. Same as AmCv 257.

258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Allen, Krulfeld
Anthropological approaches to aesthetic problems and theories of symbolism in the context of ethnographic materials.

259 **Topics in American Folklife** (3) Staff
A seminar devoted to a variety of subjects related to folklore and folklife, such as public sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. Same as AmCv 259.

260 **Seminar: Culture Theory** (3) Krulfeld, Allen
Contemporary theories of culture. Intensive study of major works.

262 **Seminar: Applied Anthropology** (3) Lewis
Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons, Turnbull
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

264 **Seminar: Anthropological Museum Techniques** (3) Humphey, Turnbull
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)

266 **Seminar: Technology** (3) Humphrey, Lewis
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Krulfeld
Comparative study of systems of production, distribution, and consumption, in both preliterate and complex societies. (Fall)

268 **Seminar: Peasant Society** (3) Krulfeld
Cross-cultural analysis of peasant societies, including their manner of functioning within their larger social, economic, and cultural context. (Fall)

269 **Seminar: Structural Problems** (3) Simons
Selected topics in social anthropology, including kinship, political, and legal principles of group formation. Emphasis may be given to model building, network analysis, incest, ethnoarchaeology, or other major social concerns. (Spring)

272 **Seminar: Topics in Latin American Anthropology** (3) Allen, Koch-Weser
Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archaeological problems.

273 **Seminar: Urban Anthropology** (3) Hertz
A review of the literature on urban kin groups, occupational/class and ethnic communities, migrant adaptations; the nature of urbanism; urban poverty; urban field methods. (Spring)

274 **Seminar: Topics in American Culture** (3) Hertz
Review of anthropological literature on American world view, mainstream and alternate forms of kinship, selected ethnic groups, and the effects of sex, age, class, occupation, and politics on American life. (Fall)

282 **Seminar: Advanced Archaeology—New World Prehistory** (3) Humphrey
Current archaeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archaeology** (3) Brooks
Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Econ/Geog/Hist/Span 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Advanced Museum Research** (3) Staff
Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Anthropology in the Museum** (3) Evans
Anthropological materials (in the broadest sense), exhibits, and museums. Topics include: museum anthropology, collections, research, interpretation, and education, with a focus on the practical problems of developing an anthropological exhibit hall. (Spring)

292 **Introduction to Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Method and theory of conservation, including fine arts, ethnographic archaeological and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of museum objects and the ways they react to their environment. The summer course deals with conservation of archaeological materials. (Fall, spring, and summer)

293 **Preventive Conservation Techniques** (3) Rose
Joint offering of the Anthropology and Art Departments. Practical aspects of preventive conservation such as monitoring environmental conditions with measuring and recording devices; examining objects and documenting their conditions (including photography); and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292. (Spring)

294 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the Anthropology Department and the American Studies Program. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

298 **Dumbarton Oaks Courses** (arr.)
Courses offered each year by scholars in residence at Dumbarton Oaks, Trustees for Harvard University, are open to qualified gradu-

ate and undergraduate students with permission of department chairman. Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

299–300 **Thesis Research** (3–3)
(Fall and spring) Staff

ART

Professors L.P. Leite *(Emeritus)*, F.S. Grubar, D.H. Teller, L.F. Robinson *(Chairman)*, J.F. Wright, Jr.
Professorial Lecturers Grace Evans, D.A. Brown, L. Miller
Associate Professors H.I. Gates, J.L. Lake, A.H. Smith, T. Ozdogan, D.M. Hitchcock, J.C. Anderson, B. Von Barghahn
Adjunct Associate Professors Grose Evans, A.D. Ullberg
Associate Professorial Lecturers B.S. Glassman, D. Von Endt, M.S. Kernan, D.C. Lynn
Assistant Professors W.T. Woodward, F. Griffith, C.C. Costigan, S.B. Molina, M.P. Lader, E.R. Williams, J.L. Stephanic, M.W. Fu *(Visiting)*
Adjunct Assistant Professor **C.R. Rose**
Assistant Professorial Lecturers E.L. Battaglia, E.P. Lawson, K. Montgomery, L. Smith, A.B. Barnhart, C. Smigrod, B.G. Carson, C.R. Smith, N.W. Merritt, M.J. Francis, B.R. Wendel, R.C. Ansell, J.F. Harrop, B.R. Stevens, G. Irby, L.W. Hicks, C.M. Register, R. Schanzer, A. Masters, R. Rodriguez, J. Paradiso
Curator, Dimock Gallery L.D. Miller

***Bachelor of Arts with a major in art history (departmental)*—The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. Prerequisite courses—Art 31–32 and 71 or 72.
3. Required courses in related areas—Art 137; Fren 1–2, 3–4, or Ger 1–2, 3–4; Phil 162; or equivalent.
4. Required courses in the major—Art 101 and 102, 104 or 105, 106 or 107, 108, 109 or 110, 113 or 114, 117 or 118 or 119, 129; nine additional semester hours in second-group art history courses.
5. A maximum of nine semester hours in Fine Arts, including Art 137, is permitted.

Graduation with Special Honors: Students must satisfy the general requirements stated under Regulations. They should apply to the chairman of the department at the beginning of their senior year. Before admittance to the program, they must pass a reading examination in either French or German. Upon acceptance, candidates will be assigned to one or more faculty advisors under whose direction they will undertake a supervised program of study.

***Bachelor of Arts with a major in Fine Arts (departmental)*—The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. A total of 54 hours of art courses is required of Fine Arts majors as stated below.

3. Required basic Fine Arts courses: Art 21–22 and 41–42.

4. Required courses in art history: Art 31–32; six additional semester hours in second-group art history courses.

5. Required Fine Arts courses in the major—30 semester hours of first- or second-group Fine Arts courses:

a. 15 hours, exclusive of primary area of concentration, in five of the following eight areas—ceramics, advanced drawing, advanced design, graphics, painting, photography, sculpture, and visual communication.

b. 15 hours to be taken in the primary area of concentration.

c. Students concentrating in photography must take Art 23, 24, 181, 205, 206.

6. Six additional hours of electives may be taken in the Art Department.

7. Transfer students must take at least 12 semester hours of second-group Fine Arts courses and 9 semester hours in their area of specialization at this University.

Graduation with Special Honors: Students must satisfy the general requirements stated under Regulations. They should apply in writing to the chairman of the Art Department at the beginning of their senior year. Upon acceptance, each candidate will be assigned one or more faculty advisors under whose direction a project in a special area of interest will be undertaken.

Bachelor of Arts with a major in classical archaeology and anthropology (departmental)—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to satisfy requirements.

2. Required courses in other areas: six semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field-work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Bachelor of Arts with a major in classical archaeology and classics (departmental)—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to be taken to satisfy the requirements.

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 12 semester hours in second-group courses in Greek or Latin (a reading knowledge of French and German is recommended).

Master of Arts in the field of art history—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archaeology, medieval art, Renaissance and Baroque art, eighteenth- and nineteenth-century art, contemporary*

art, or American art—Required: the general requirements stated under the Graduate School of Arts and Sciences; 36 hours of course work including six semester hours of thesis research. As many as possible of the 36 semester hours of course work should be in third-group courses; not more than six hours may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the six semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.

2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences; 42 semester hours of course work as follows: 12 hours of art history courses, taken before acceptance into the museum program; Art 201–2 and 271–72, and 18 additional hours of art history courses selected in consultation with the advisor, not more than six hours to be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. Students are required to pass the general written Master's Comprehensive Examination in Art History and may also be required to pass a written comprehensive examination in Museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Museum of American Art, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

Master of Fine Arts in the field of ceramics, design, graphics, painting, photography, sculpture, or visual communication—Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in Fine Arts in the field of ceramics, design, drawing, graphics, painting, photography, sculpture or visual communication. A 3.00 undergraduate grade-point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slides of at least 10 drawings, including figure studies, and four to six paintings, prints, sculptures, ceramics, or photographs. Students planning to do graduate work in graphics or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements stated under the Graduate School of Arts and Sciences. As a tool requirement Master of Fine Arts candidates must take Art 137 or three additional hours of course work selected in consultation with the advisor. As many as possible of the remaining 24 hours of course work should be in third-group courses, only 18 hours of which may be in one area; the remaining six hours are to be selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, graphics, painting, photography, sculpture, drawing, or visual communication will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative

thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader.

Doctor of Philosophy in the field of art history—Required: the general requirements stated under the Graduate School of Arts and Sciences, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German, a General Examination in art history, an examination in the area of specialization, and examinations in two areas related to the area of specialization. Students plan their own programs in consultation with a departmental committee.

Areas of Specialization: classical art and archeology, Medieval art, Renaissance art, Baroque art, eighteenth-century art, nineteenth-century art, twentieth-century art, and American art.

Bachelor of Arts in Education and Human Development with a teaching field in art Prerequisite: the education curriculum; required: the art option and professional courses stated under the School of Education and Human Development.

ART HISTORY

First Group

1 Principles of Art (3) Von Barghahn
An introduction to various art media, basic elements of art and thematic interpretations, European and non-Western traditions. (Fall and spring)

31–32 Survey of Western Art (3–3) Robinson and Staff
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to modern art. (Art 31 and 32—fall and spring)

71–72 Introduction to the Arts in America (3–3) Grubar and Staff
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

Second Group

101 Greek Art and Archaeology (3) Williams
A study of the major achievements in architecture, sculpture, painting, and mosaics from 1000 B.C. to the Roman period. Special focus on the Parthenon and fifth-century Athens. Attention to recent discoveries and current excavations. (Fall)

102 Roman Art and Archaeology (3) Williams
Investigation of the architecture, sculpture, wall paintings, and mosaics from the second century B.C. to ca. 350 A.D. Consideration both of the city of Rome and of the monuments and society in the provinces. Attention to current excavations, including Pompeii and Herculaneum. (Spring)

103 The Ancient Artist and His Workshop (3) Williams
A study of the ancient craftsman's techniques, workshop organization, and position in society. Exploration of sculpture, architecture, painting, pottery, mosaics, gems, glass, and metalwork.

104 Renaissance Art in Italy I (3) Grace Evans
Early developments from the 13th to the 15th century. (Fall)

105 Renaissance Art in Italy II (3) Grace Evans
High Renaissance and Mannerism. (Spring)

106 Renaissance Art in the North I (3) Hitchcock
Northern painting from van Eyck through the Antwerp Mannerists. (Fall)

107 **Renaissance Art in the North II** (3) Hitchcock
Northern painting and graphics from Dürer through Brueghel. (Spring)

108 **18th-Century Art in Europe** (3) Hitchcock
(Spring)

109 **19th-Century Art in Europe I** (3) Robinson
Examination of Neoclassicism and Romanticism in the context of Western European historical and cultural developments. Emphasis on France, England, and Germany, and the representative styles of David, Ingres, Delacroix, Turner, Constable, and Friedrich. (Fall)

110 **19th-Century Art in Europe II** (3) Robinson
Examination of the revolution in style of Realism, Impressionism, and Post Impressionism in the context of Western European political, social, and cultural developments. Emphasis on representative styles of Courbet, Manet, Monet, Cezanne, Van Gogh, and Gauguin. (Spring)

111 **Classical Archaeology** (3) Williams
Archaeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.

112 **Egypt and the Ancient Civilizations** (3) Williams
Exploration of the arts of Egypt, Sumeria, the Hittites, Assyria, and Persia, from 3000 to 400 B.C. Emphasis on the age of the Pyramids and the period of Tutankhamen. (Fall)

113 **Baroque Art in Italy** (3) Grose Evans
(Spring)

114 **Baroque Art in the North** (3) Hitchcock
Concentration on France, Flanders, and Holland, with emphasis on Poussin, Rubens, Van Dyck, and Rembrandt. (Fall)

115 **Christian Iconography** (3) Grace Evans
Origins and development of Christian symbols and themes from early Christian to the Council of Trent.

116 **Islamic Art** (3) Staff

117 **Medieval Art I** (3) Anderson
Early Christian and Byzantine. (Fall)

118 **Medieval Art II** (3) Anderson
Romanesque and Gothic. (Spring)

119 **Pre-Romanesque Art in the North** (3) Anderson
Merovingian and Carolingian. (Spring)

120 **East Asian Art** (3) Staff
May be repeated for credit when content differs.

121 **Spanish Art I** (3) Von Barghahn
Discussion of areas selected from the art of ancient Iberia through the seventeenth century. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

122 **Spanish Art II** (3) Von Barghahn
Discussion of areas selected from the eighteenth through twentieth centuries. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

129 **20th-Century Art in Europe** (3) Lader
Survey of 20th-century European painting, sculpture, and architecture, from their origins in the late 19th century through Surrealism. Emphasis on major modernist movements and artists, including Matisse, Picasso, Kandinsky, and Mondrian. (Fall)

130 **20th-Century American Art** (3) Lader
Survey of 20th-century American painting and sculpture, focusing upon the avant-garde. Emphasis on artists of the Stieglitz circle and later modernist movements such as Abstract Expressionism, Pop, Op, Minimal, and Conceptual art. (Spring)

140 **Gothic Architecture** (3) Staff

145 **Folk Arts in America** (3) Grubar
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

147 **Primitive Art I: Ancient Civilizations of Mexico and Latin America** (3) Von Barghahn
Survey of Pre-Columbian art and architecture from prehistoric period to the Spanish conquest, inclusive of Yucatan and Central American regions.

148 **19th-Century American Painting** (3) Grubar
(Fall)

149 **19th-Century American Sculpture** (3) Grubar
(Spring)

150 **Landmarks in American Art** (3) Grubar

155 **The Aegean Civilizations** (3) Williams
An introduction to the excavational and multidisciplinary aspects of classical archaeology. Minoan and Mycenaean civilizations (1700–1200 B.C.). Interrelationships between Greek and Persian cultures of the sixth and fifth centuries B.C. (Spring)

156 **Early Medieval Sculpture** (3) Grace Evans

161 **Studies in Renaissance Art** (3) Grace Evans

162 **Principles of Museum Work** (3) Lawson
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service.

165 **Primitive Art II: African, Oceanic, North American Indian** (3) Von Barghahn
Survey of architecture, sculpture, and painting from ancient kingdoms to early 20th-century culture. Emphasis upon imagery and iconography.

167 **The Dynastic Courts of Europe** (3) Von Barghahn
Politics and royal patronage, 1400–1800. Spain, Portugal, Austria, Germany, Russia.

169 **History of Decorative Arts: European Heritage** (3) Carson
Survey of changing styles of European furniture, textiles, ceramics and glass, in the context of general trends in art history and changing patterns in economic, technological, social, and cultural history. From antiquity to the modern age. (Fall)

170 **History of Decorative Arts: American Heritage** (3) Carson
Examination of the decorative arts in America from the 17th century to the modern period. Exploration of changing visual characteristics in relation to the changing American experience. (Spring)

173 **History of the Cinema** (3) Staff
Same as AmCv/SpDr 173.

187 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300-1800)
Same as Engl/Fren/Ger/Hist/Phil/Rel 183.

192 **The American Cinema** (3) Staff
Same as SpDr 192.

197 **History of Photography: The 19th Century** (3) Battaglia
198 **History of Photography: The 20th Century** (3) Battaglia

Third Group

201–2 **Museum Projects** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the field of museum training.

203 **Primitive Art** (3) Staff
(Spring)

207 **Modern Architecture** (3) Lader
Europe and America.

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Art and Anthropology Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Von Endt
Joint offering of the Art and Anthropology Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)

216 **Medieval Painting** (3) Grace Evans
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) Ullberg
Art 217 is prerequisite to Art 218.

*220 **Seminar: Baroque Art of the 17th Century** (3) Hitchcock
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

*221 **Seminar: Renaissance Art** (3) Staff
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

*†243 **Seminar: American Art** (3) Grubar
(Fall and spring)

*†244 **Seminar: 19th-Century European Art** (3) Robinson
Reading knowledge of French desirable.

*†245 **Seminar: 20th-Century European Art** (3) Lader

*246 **Seminar: Classical Art** (3) Williams

*247 **Pro-Seminar: Medieval Art and Archaeology** (3) Anderson

248 **Independent Research in Art History** (3)
(Fall and spring)

*261 **Seminar: Problems in Art History** (3) Staff

271–72 **Museum Techniques** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Staff
Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smith-

* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.
† Laboratory fee, $15 when course is taught off campus.

sonian Institution. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3) Staff
(Fall and spring)

292 **Introduction to Conservation** (3) Rose
Interdepartmental course offered by the Art and Anthropology Departments. Method and theory of conservation, including fine arts, ethnographic, archeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

293 **Preventive Conservation Techniques** (3) Rose
Interdepartmental course offered by the Art and Anthropology Departments. Practical aspects of preventive conservation such as monitoring environmental conditions with measuring and recording devices; examining objects and documenting their conditions (including photography); and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292.

Fourth Group

Limited to art history doctoral candidates. Offered as the demand requires.

*385–86 **Readings in Art History** (3–3)

*398 **Advanced Reading and Research** (arr.)
For students preparing for the doctoral examination.

*399 **Dissertation Research** (arr.)

FINE ARTS

Departmental prerequisite: Art 21–22 and 41–42 (students concentrating in photography substitute Art 23 and 24 for 41–42).

First Group

21–22 **Design I: Basic** (3–3) Costigan, Teller
Required of all Fine Arts majors. Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, $15. Art 22: Laboratory fee, $21. (Art 21 and 22—fall and spring)

23 **Photography I: Introduction** (3) Lake and Staff
Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, $54. (Academic year)

24 **Photography II** (3) Stephanic
Continuation of Art 23. Experimentation with black and white films and developers. Improvement of printing and exposure techniques. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, $54. (Academic year)

41–42 **Drawing I** (3–3) Wright and Staff
Elementary investigation of concepts of drawing, both traditional

* May be repeated for credit.

and contemporary; training in perception, analysis of form in light and space; instruction in the use of graphic materials and media; exercises in connoisseurship. Material and model fee, $30 per semester. (Art 41 and 42—fall and spring)

51 **Introduction to Handbuilt Ceramics** (3) Ozdogan, L. Smith
Working with clay as an art form. Exploration of pinch, coil, slab, hump and press mold, paddling and hollowing techniques. Sketch studies, reduction and oxidation kiln-firings, clay and glaze making. Laboratory fee, $54.* (Fall and spring)

52 **Introduction to Wheelthrown Ceramics** (3) Ozdogan and Staff
Development of cylindrical and open forms. Trimming, clay and glaze making, reduction and oxidation kiln firings. Sketch studies. Laboratory fee, $54.* (Fall and spring)

57–58 **Graphics I** (3–3) Griffith, Wright
Exploration of the methods of intaglio, relief, printing, and other composite processes. Material fee, $30 per semester. (Academic year)

61–62 **Water Color** (3–3) Staff
Painting in transparent and opaque water color and in acrylic. Experimentation, figurative and landscape. Laboratory fee, $15 per semester. (Academic year)

65–66 **Painting I** (3–3) A. Smith and Staff
Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Prerequisite: Art 21, 41. Material and model fee, $39 per semester. (Academic year)

81–82 **Sculpture I** (3–3) Gates and Staff
Beginning study of design and fabrication of sculpture. Basic sculptural techniques for media, including clay, plaster, stone, and wood. Laboratory fee, $24 per semester. (Academic year)

Second Group

Second-group art courses may be repeated for credit with approval of the department.

123–24 **Individual Problems** (3–3) Staff
Emphasis on problems and materials of specific interest to the student in any area of Fine Arts. Laboratory fee depending on area chosen.† Prerequisite: permission of instructor. (Academic year)

125–26 **Painting II** (3–3) A. Smith
Alteration of personal expression and structured problems dealing with still-life and the figure. Use of acrylic and oil. Material and model fee, $39 per semester. (Academic year)

127–28 **Painting III** (3–3) Woodward
Studies in the interpretation of the figure and still-life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material and model fee, $39 per semester. (Academic year)

131 **Intermediate Ceramics: Wheelthrown Functional Forms** (3) Ozdogan and Staff
Aesthetic and technical development of wheelthrown functional ceramic forms. Exploration of attachments: lids, spouts, handles, and footing devices. Sketches and technical drawings, clay and glaze-

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* Laboratory fee in all ceramics courses includes unlimited materials and tools.

† *Schedule of Fees:* Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$30; Graphics—$36; Sculpture $24; Typography $30, Painting none; Photography $54; Visual Communication —$30; Lithography—$38; Serigraphy—$21.

making tests, varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, $54.* (Fall and spring)

132 **Intermediate Ceramics: Wheelthrown Non-functional Forms** (3) Ozdogan and Staff
Aesthetic and technical development of thrown ceramic sculptural forms. Emphasis on section throwing, closed forms, and construction. Varied temperature firings in oxidation and reduction atmospheres. Clay and glaze making. Laboratory fee, $54.* (Fall and spring)

133 **Ceramic Decoration** (3) Ozdogan
Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee, $54* (Fall)

134 **Non-Silver Printing Processes in Photography** (3) Smigrod
(Formerly History of Photography)
Introduction to non-silver and archaic photographic processes. At least three processes will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Spring)

135–36 **Advanced Water Color** (3–3)
Development of techniques of water color; concentration on special projects. Laboratory fee, $15 per semester. (Academic year)

137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, A. Smith, and Staff
Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $15. (Fall and spring)

138 **Graphics: History and Practice** (3) Griffith
Laboratory fee, $36.

139 **Design in Fiber** (3) Costigan
Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Prerequisite: Art 21–22 or permission of instructor. Laboratory fee, $9.

141 **Interior Design I** (3) Teller
Survey of materials and techniques used in domestic dwellings. Emphasis on diagrams, floor plans, and effective use of materials. Lecture and studio problems. Laboratory fee, $21.

142 **Interior Design II** (3) Teller
Survey of furniture style as applied to drawingboard problems in creative interior design. Prerequisite: Art 141. Laboratory fee, $21.

143–44 **Serigraphy** (3–3) Teller
Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Prerequisite: Art 21 and 41–42. Laboratory fee, $21 per semester. (Academic year)

146 **Ceramic Restoration** (3) Ozdogan
Methods and techniques for museum and commercial application. Laboratory fee, $54. (Summer)

151 **Ceramic History and Technology** (3) Ozdogan and Staff
A survey of the history of ceramics and its technology. Lectures, demonstrations and supplemental programs. (Fall)

152 **Ceramic Sculpture** (3) Ozdogan, L. Smith
Developing an understanding of the sculptural ceramic form which

* Laboratory fee in all ceramics courses includes unlimited materials and tools.

integrates both quality and creativity. Techniques in hollow and solid construction. Varied temperature firings in reduction and oxidation kilns. Laboratory fee, $54. (Fall)

153–54 **Graphics II** (3–3) Griffith, Wright
Advanced relief, intaglio, and other composite processes. Prerequisite: Art 57–58. Material fee, $36 per semester. (Academic year)

157–58 **Graphics III** (3–3) Griffith
Exploration of combined techniques and mixed media. Prerequisite: Art 57–58. Material fee, $36 per semester. (Academic year)

159–60 **Drawing II** (3–3) Wright and Staff
Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Prerequisite: Art 41–42. Material and model fee, $30 per semester. (Academic year)

163 **Visual Communication I: Basic Layout** (3) Molina and Staff
Layout stages including basic formats, production processes; working with type and basic skills. Prerequisite: Art 171. Laboratory fee, $30.

164 **Visual Communication II: Problem Solving** (3) Molina and Staff
Conceptual approach to problem solving. Various graphic design problems, including both small-format and large-format design in commercial and institutional graphics. Prerequisite: Art 163, 172. Laboratory fee, $30.

166 **Advanced Drawing Techniques** (3) A. Smith and Staff
Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different. Prerequisite: Art 41–42. Laboratory fee, $21.

168 **Intermediate Ceramic Design in Handbuilding** (3) Ozdogan
Further concentration in handbuilding techniques of pinch, coil, slab, hump and press mold, paddling and hollowing techniques. Sketch studies, clay and glaze tests. Orientation to studio operations and maintenance. Laboratory fee, $54. (Fall and spring)

171 **Typography I** (3) Molina and Staff
Basic calligraphy for traditional and contemporary use. Type theory, including specification, copy fitting, and study of letter form as used in graphic design. Laboratory fee, $30.

172 **Typography II** (3) Molina and Staff
Study of type classification, recognition, and adaptation. Methods of type specifications, copy-fitting and typesetting processes. Typographic layout and alphabet design. Prerequisite: Art 171. Laboratory fee, $30.

174 **Visual Communication III: Seminar Projects** (3) Molina and Staff
Advanced studio projects in client presentations and development of portfolio. Prerequisite: Art 164 and 172. Laboratory fee, $30.

175 **Lithography** (3) Barnhart
Study of techniques and materials related to printing images from stones and metal plates, in black and white and color. May be repeated for credit. Material fee, $36.

177–78 **Survey of Printing and Illustration** (3–3) Staff
Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)

179–80 **Sculpture II** (3–3) Gates
Expansion of Sculpture I utilizing advanced wood milling equipment and metal welding techniques. Prerequisite: Art 81-82. Laboratory fee, $24.

181 **Introduction to Color Photography** (3) Lake
Introduction to color through exposure and processing of color transparency films. Use of filters for creating and correcting color shifts, with emphasis on color as subject matter. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall)

182 **Introduction to Photographic Lighting** (3) Stephanic
Introduction to various lighting techniques. Available light manipulation, studio lighting, and copy lighting will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

183 **Experimental Photography** (3) Staff
Structured exploration of various photographic processes and techniques. Emphasis on creative expression. Content of course will vary; contact department for current offering. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

185–86 **Portrait Painting and Drawing** (3–3) C. Smith
Fall: Various media: drawing and pastel. Spring: Oil. Model fee, $39 per semester.

189–90 **Sculpture III** (3–3) Gates
Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179–80. Laboratory fee, $24 per semester. (Academic year)

193 **Film Making I** (3) Kernan
Introduction to the basic techniques and procedures for film making. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

194 **Film Making II** (3) Kernan
Continuation of Art 193 with more advanced projects. Prerequisite: Art 193 or permission of instructor. Laboratory fee, $54. (Fall and spring)

195 **Documentary Photography** (3) Battaglia
Historical development of documentary photography. Completion of two projects required. Laboratory fee, $54. Prerequisite: Art 23 and 24 or permission of instructor. Same as Jour 195. (Fall)

Third Group

All third-group art courses may be repeated for credit with the approval of the department.

205 **Advanced Photography: Zone System Tests** (3) Lake
Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, $54. (Fall and spring)

206 **Advanced Photography: Color Printing** (3) Lake
Printing from color negatives. Correct color balancing and creative color shifts will be explored. Emphasis on creative expression. Prerequisite: Art 181 or permission of instructor. Laboratory fee, $54. (Fall and spring)

208 **Advanced Photography: Special Projects** (3) Lake and Stephanic
Independent projects requiring approval prior to registration. Prerequisite: Art 181 and 182, or permission of instructor. Laboratory fee, $54. (Fall and spring)

209–10 **Exhibition and Display Design** (3–3) Miller

224 **Advanced Ceramic Sculpture** (3) Ozdogan
Continuation of Art 152 with emphasis on individual approach. Ex-

ploration of mixed media and mold casting. Laboratory fee, $54. (Fall)

225 **Advanced Ceramic Decoration** (3) Ozdogan, Smith
Perfection of decorating techniques. Students establish style through independent exploration. Laboratory fee, $54. (Spring)

226 **Architectural Ceramics** (3) Ozdogan
Advanced studies in ceramic murals and sculpture oriented toward indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, $54. (Spring)

231–32 **Design III** (3–3) Gates
New media and techniques in three-dimensional design. Laboratory fee, $24 per semester. (Academic year)

234 **Design IV** (3) Gates
Theory and fabrication of jewelry using basic metal techniques, assemblage approach, and lost-wax casting. Laboratory fee, $30. (Fall and spring)

235 **Design V: Textile Printing** (3) Teller
Designing and executing textiles using the techniques of silk screen, block print, and batik. Laboratory fee, $21. (Fall and spring)

248 **Independent Research in Fine Arts** (3)
For master's degree candidates; open to limited number of qualified undergraduates, with permission. Independent research arranged in consultation with individual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.* (Fall and spring)

249 **Theory of Design** (3) Costigan
Application of design principles to problems of the artist in all disciplines. Emphasis on individual creativity, presentation, and criticism. Guest lectures on issues in contemporary art. Open to all MFA candidates and to seniors with permission of instructor. Laboratory fee, $9.

251 **Advanced Ceramic Design in Wheel Throwing** (3) Ozdogan
Individual projects on the potter's wheel. Student establishes personal style and direction, and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays, glazes, and firings is required. Laboratory fee, $54. (Fall and spring)

252 **Advanced Ceramic Design in Hand Building** (3) Ozdogan
Individual projects in hand building. Student establishes style and direction, and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays and glazes is required. Laboratory fee, $54. (Fall and spring)

253 **Industrial Ceramic Design/Mold Making** (3) Ozdogan
Study in the multiple production process from model making to finished duplicate form as it exists on factory level. Methods include all aspects of model designing and making in clay and plaster; mold making in plaster; production methods from molds including press molding, slip-casting, jiggering, and jollying. Laboratory fee, $54. (Fall and spring)

254 **Ceramic Glazes: Calculation and Formulation** (3) Glassman
Laboratory fee, $21.

255–56 **Graphics IV: Advanced Serigraphy** (3–3) Teller
Utilization of principles and techniques of serigraphy toward de-

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* *Schedule of Fees:* Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$30; Graphics—$36; Sculpture—$24; Typography—$30; Painting—none; Photography—$54; Visual Communication—$36; Serigraphy—$21; Lithography—$36.

velopment of personal statement and style. Prerequisite: Art 143–44. Laboratory fee, $21 per semester. (Academic year)

257–58 **Graphics V: Etching and Engraving** (3–3) Griffith
Prerequisite: Art 157–58. Material fee, $36 per semester. (Academic year)

259 **Graphics VI: Lithography** (3) Barnhart
Individual problems and critiques in printmaking, mixed media, papermaking, hand book binding, and typesetting. Material fee, $36. (Fall and spring)

260 **Graphics VII: Relief Printing** (3) Griffith
Material fee, $36. (Fall and spring)

265–66 **Painting IV** (3–3) Woodward
Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, $39 per semester. (Academic year)

267–68 **Individual Problems in Photography** (3–3) Stephanic
Limited to MFA candidates and qualified undergraduates. Prerequisite: Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, $54 per semester. (Academic year)

275 **Painting V** (3) Woodward
Development of personal imagery. Individual problems and critiques. Material and model fee, $39.

277–78 **Advanced Visual Communication** (3–3) Molina
Design and execution of graphic design projects, including magazine spreads, posters, advertisements, trademarks, letterheads, packages. Psychological and symbolic aspects of design solutions. Laboratory fee, $36 per semester. May be repeated for credit if content differs. (Academic year)

279–80 **Sculpture IV** (3–3) Gates
Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, $24. (Academic year)

281 **Sculpture V** (3) Gates
Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, $24. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
Laboratory fee depending on area chosen.* (Fall and spring)

ART THERAPY—GRADUATE PROGRAM

Professors B.I. Levy *(Program Director)*, D.E. Silber
Adjunct Associate Professors E. Ulman *(Coordinator of Training)*, E. Kramer
Assistant Professor K.J. Williams
Adjunct Assistant Professors W. Maiorana, M. Fleming, P.A. Ravenscroft
Clinical Instructors M.S. Schmal, P. Howie, D.K. Conger, B.K. Mandel, N.J. Schoebel, K.M. Jensch, B. Burns-Shostak, C.M. Grimaldi, N.J. Miller, J.C. Ramsay, E.S. Kramer, B. Sobol
Lecturer A.J. DiMaria

* Schedule of Fees: Ceramics—$54, 2-D Design—none; 3-D Design—$24; Drawing—$30; Graphics—$36; Sculpture—$24; Typography—$30; Painting—none; Photography—$54; Visual Communication—$36; Serigraphy—$21; Lithography—$36.

Master of Arts in the field of art therapy—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in art, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Prospective candidates should consult the brochure which describes the program for specific requirements.

Fields of emphasis: adult art therapy, family art therapy, child art therapy, and research.

201 **Introduction to Art Therapy** (3) Ulman
Lectures, presentation of illustrative case material, class discussion of assigned readings, field work. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to art therapy degree candidates. (Fall)

202 **Case Studies in Art Therapy** (3) Ulman
Discussion of case material provided by students in order to refine methods of working, improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

203 **Technique of Art Therapy** (3) Williams
Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to art therapy degree candidates. (Fall)

204 **The Freudian Model in Art Therapy** (3) Kramer, Ulman
Concepts of instinctual drives; ego development; mechanisms of defense; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Fall)

205–6 **Family Art Techniques** (3–3) Ravenscroft
Principles of work with families, with emphasis on the use of art techniques for evaluation of family dynamics. The major focus is on opportunities to conduct and observe family art evaluations. Enrollment is limited to 12. Prerequisite: ArTh 201, 203. Open to art therapy degree candidates only. (Fall and spring)

207 **Art as Therapy with Children** (3) Maiorana
Introduction to the practical and theoretical considerations involved in art as therapy with children. Focus on psychodynamics, artistic developmental stages, methods of child art evaluation, and basic issues in therapeutic guidance of the child. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Fall)

208 **Art Therapy with Adolescents** (3) Fleming
Theoretical and practical issues in art therapy with adolescents in educational and clinical settings. Experiential work in art techniques appropriate to this population. Class discussion of readings on adolescent development. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

211 **Survey of Art Therapy** (3) Maiorana, Williams, DiMaria
Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. Not intended for art therapy degree

candidates. Open to advanced undergraduates with permission of instructor. (Fall and spring)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor.

220 **Process of Art Therapy** (6) Maiorana, Williams
Exploration of the treatment process. Students discuss literature from art therapy and related fields and rehearse fundamental ways of being an art therapist through videotaped role-playing. Designed to increase students' ability to evaluate their own therapeutic effectiveness. Prerequisites: ArTh 201, 203; open to others with permission of instructor. (Spring)

275 **Group Art Therapy** (3) Williams
Experience as participant, observer, and leader in an art-centered group; required reading; theory of group process. Open to art therapy master's degree candidates and others with permission of instructor. (Summer)

283–84 **Practicum in Art Therapy** (3–3) Staff
Minimum of 300 hours field work per semester connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203. Open only to art therapy degree candidates.

285 **Special Projects in Art Therapy** (3) Staff
Individual work based on research. Empirical, clinical, and library research may be undertaken, as well as the development of new procedures. Details to be worked out with each student. May be repeated for credit with advisor's approval. Open only to degree candidates. (Fall and spring)

289 **Special Topics in Art Therapy** (3) Staff
Connections between art therapy and other disciplines; new developments in the field. May be repeated for credit with approval of advisor. Open to art therapy degree candidates and others with permission of instructor.

290 **Workshops in Art Therapy** (3) Staff
Art therapists and other mental health professionals will conduct four weekend workshops during the semester. Emphasis on the elucidation of concepts of treatment through lectures, discussion, and participation. (Spring)

ASTRONOMY

See **Physics.**

BIOCHEMISTRY—GRADUATE PROGRAMS

Professors B.W. Smith, G.V. Vahouny, J.M. Bailey, A.L. Goldstein *(Chairman)*, C.R. Treadwell *(Emeritus)*
Associate Professors L.L. Gallo, A. Kumar, T. Moody
Assistant Professor R.S. Schulof

Master of Science in the field of biochemistry—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22, 225–26, 229, 299–300; Chem 251. The remaining courses are to be selected from Bioc 231, 232, 240, 250, 260, 270, 280. It is expected that students will complete all of the required work in approximately two years.

Doctor of Philosophy in the field of biochemistry—Required: the general requirements stated under the Graduate School of Arts and Sciences.

Research fields: endocrinology—thymosin, steroid hormones, prostaglandins; immunology—immuno-chemistry, thymosin peptides; molecular biology—RNA metabolism, protein synthesis, gene transfer; lipid chemistry and metabolism—essential fatty acids, lipoproteins, complex lipids, cholesterol, peroxides, atherosclerosis, steroidogenesis; nutrition—dietary fiber, dietary fat, trace minerals; neurochemistry– endorphins, enkephalins, nerve growth factors, bombesis; protein chemistry; B_{12} coenzymology.

221-22 **General Biochemistry** (3–4) Gallo and Staff
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

225–26 **Introduction to Biochemical Research** (arr.) Smith and Staff
Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used in those units. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Bryant*
Current literature in biochemistry. Open to graduate students in the biomedical sciences and to a limited number of medical students. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson†
Content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff
Directed readings in various areas of enzymology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Fiskum‡ and Staff
Content includes laws of thermodynamics, application of these laws to biological systems; oxidation—reduction processes and other special topics. Prerequisite: Bioc 221–22. (Fall)

232 **Protein Chemistry** (2) Steers§ and Schechter§§
Content includes the theory and methods of protein chemistry, the structure-function relationship of proteins and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

240 **Nutrition** (2) Walker and Staff
Content includes discussion of RDA, nitrogen-balance, vitamins and

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* Robert Wesley Bryant is Associate Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.
† Elizabeth Potts Anderson is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
‡ Gary M. Fiskum is Assistant Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences
§ Edward Steers, Jr., is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
§§ Alan Neil Schechter is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

minerals, diets and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 **Current Topics in Nutrition** (1 or 2) Walker and Staff
Directed readings in various areas of nutrition. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 240.

250 **Cell and Molecular Biology** (3) Kumar and Staff
Content includes the organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

251 **Current Topics in Molecular Biology** (1 or 2) Kumar and Staff
Directed readings in the area of molecular biology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 250.

252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Kumar and Staff
Emphasis on the biochemical and molecular aspects of selected major diseases. The format will be of a tutorial type, including presentations of material by students. (Spring)

256 **Biochemical Genetics and Inherited Metabolic Diseases** (1 or 2) Merril
Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. Prerequisite: Bioc 250. (Spring)

260 **Lipids** (2) Gallo and Vanderhoek*
Content includes the biosynthesis, metabolism, and functions of lipoproteins, prostaglandins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

261 **Current Topics in Lipids** (1 or 2) Vahouny and Staff
Directed readings in the area of lipid biochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 260.

263 **Steroids** (2) Dodek†
For medical students; open to a limited number of graduate students. Content includes chemistry of steroid pathways of biosynthesis and metabolism, clinical manifestations of steroid unbalance, steroid changes in pregnancy and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

264 **Membrane-Associated Complex Lipids** (1) Fishman‡
Topics will cover the catabolism and biosynthesis of complex sphingolipids; inherited metabolic diseases associated with abnormal sphingolipid metabolism; membrane receptors for hormones and toxins; and other special topics. Prerequisite: Bioc 221–22. (Spring)

270 **Biochemistry and Cell Biology of the Immune Response** (2) Zatz§ and Staff
Biochemical aspects of the immune response at the molecular and cellular level. Modern experimental approaches to immunology and

* Jack Yehudi Vanderhoek is Assistant Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.
† Oscar Irving Dodek, Jr., is Clinical Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.
‡ Peter Harvey Fishman is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
§ Marion M. Zatz is Adjunct Associate Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.

cell biology. Prerequisite: Bioc 221–22 and Micr 229, or permission of instructor. (Spring)

271 **Current Topics in Immunology** (1 or 2) Goldstein and Staff
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 270.

280 **Neurochemistry** (2) Moody and Staff
(Formerly Biochemistry of Nerve Tissue)
Content includes molecular structure and function of nerve tissue; intra- and inter-neuronal communication mechanisms; biochemistry of various brain dysfunctions; and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

281 **Current Topics in Neurochemistry** (1 or 2) Moody and Staff
Directed readings in neurochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 280.

295 **Research in Biochemistry** (arr.) **Staff**
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BIOLOGICAL SCIENCES

Professors R.L. Weintraub *(Emeritus)*, K.F. Parker *(Emeritus)*, S.O. Schiff *(Chairman)*, D.L. Atkins, R.K. Packer
Adjunct Professors L.S. Kornicker, C.G. McWright
Professorial Lecturers W.A. Shropshire, Jr., J.C. Petricciani, H. Hoffman
Associate Professors R.E. Knowlton, H. Merchant, T.L. Hufford, D.E. Johnson, J.R. Burns
Associate Professorial Lecturers P.E. Spiegler, J.C.C. Dickens, B.M. Timberlake, D.A.P. Houston
Assistant Professors R. Donaldson, E.F. Wells, K.M. Brown, D.L. Lipscomb, H.B. Wagner
Adjunct Assistant Professor K.B. Hellman
Assistant Professorial Lecturer L.C. Grow

Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the humanities.)
2. Prerequisite courses—BiSc 11–12, or equivalent.
3. Required courses in related areas—Chem 11–12; Chem 151–52 and 153–54, or 50. (The following courses are strongly recommended: Math 31; Phys 1, 2; two years of French, German, or Russian; Stat 91 or 127.)

4. (a) Required courses for the major in biology—a minimum of 24 semester hours of second-group courses, which should include at least six hours in biology, six in botany, and six in zoology. In fulfillment of the botany requirements, students may take either BiSc 133 or 137, but not both.

(b) Required courses for the major in botany—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included. In fulfillment of the botany requirements, students may take either BiSc 133 or 137, but not both.

(c) Required courses for the major in zoology—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.

5. The Bachelor of Science degree requires two semesters of introductory physics with lab in addition to the requirements listed above.

If a student has completed the required number of hours to satisfy distribution requirements in the major, but received a *D* in one of the courses, the student must take another course in the specific field (botany, zoology, or biology) in which the *D* was received.

Special Honors.—In addition to the general requirements stated under Regulations, in order to be considered for graduation with special honors, a student must attain grades of *A* or *B* in half of all courses taken in the biological sciences and in all other science courses required for the major.

Minor in biology—12 semester hours of second-group courses,* which must include at least 3 hours in biology, 3 in botany, and 3 in zoology.

Minor in botany—12 semester hours of second-group courses,* of which 8 hours must be in botany.

Minor in zoology—12 semester hours of second-group courses,* of which 8 hours must be in zoology.

Master of Science in the field of biology, botany, or zoology—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). With the permission of the department a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Master of Arts in the field of museum studies, with specialization in the biological sciences, see Museum Studies.

Doctor of Philosophy in the field of biology, botany, or zoology—Required: the general requirements stated under the Graduate School of Arts and Sciences, plus satisfactory completion of a Preliminary Examination and the General Examination in four areas of biology. The program of study, fields of study, and tool subjects are determined in consultation with an advisory committee appointed for each candidate.

Research fields in biology: bioenergetics, cell biochemistry, community and ecosystem ecology, Drosophila genetics, evolutionary biology, population ecology, population genetics, Protistology, radiation biology, terrestrial ecology, urban biology, water pollution biology.

* BiSc 171 through 176 do not count toward fulfillment of the 12-hour second-group course requirements.

Research fields in botany: aquatic botany, chemotaxonomy, phycology, plant ecology, plant physiology, vascular plant systematics.

Research fields in zoology: animal ecology, comparative neuroanatomy, comparative vertebrate anatomy, crustacean biology, developmental biology, ichthyology, invertebrate zoology, marine biology, parasitology, vertebrate anatomy and physiology, vertebrate embryology, vertebrate endocrinology.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see Geobiology.

Bachelor of Arts in Education and Human Development with a teaching field in biology—Interested students should contact the Office of the Dean of the School of Education and Human Development.

Departmental prerequisite: BiSc 11–12 or equivalent is prerequisite to all second-group courses in biology, botany and zoology, except by permission of the instructor.

BIOLOGY

First Group

3–4 Introductory Biology for Nonscience Majors (3–3) **Schiff**
Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in the environment. Prerequisite to BiSc 4: BiSc 3. Material fee, $18 per semester. (Academic year)

11–12 Introductory Biology for Science Majors (4–4) Hufford, Lipscomb
Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles are demonstrated through consideration of the plant as an organism. BiSc 12: Beginning principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester. (Academic year)

Second Group

103 Marine Biology (4) **Knowlton**
Lecture (2 hours), laboratory and field (3 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal eco-systems and man's influence on them. Recommended prerequisite: BiSc 101 or 102, 106, 140. Material fee, $24. (Spring)

107 Field Biology (4) **Merchant**
Field study of altitudinal zonation, species hybridization, territoriality, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer, odd years)

108 Organic Evolution (3) Lipscomb
Synthetic theory of organic evolution including treatment of speciation, adaptive radiation, biogeography, population biology, sociality, and human evolution. (Fall)

111 Introductory Microbiology (4) **Staff**
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $24. (Fall and spring)

122 Cell Biology (3) Donaldson
Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Spring)

123 Cell Biochemistry (3) Donaldson
Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Fall)

124 Cell Biochemistry Laboratory (2) Donaldson
Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Material fee, $24. (Fall)

127 Genetics (3) Johnson
Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action. (Fall and spring)

128 Genetics Laboratory (1) Johnson
Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $24. (Fall and spring)

138 Advanced Genetics (3) Johnson
Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

140 General Ecology (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer, and their relationship to the structure and function of population, species, communities, and ecosystems. Material fee, $24. (Fall)

142 Behavioral Ecology (3) Wagner
Lecture (2 hours), laboratory and field (2 hours). An evolutionary approach to the study of the relationship between behavior and ecology. Includes discussion of sociobiology. Prerequisite: BiSc 140. Laboratory fee, $24. (Fall)

144 Aquatic Ecology (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physiochemical properties, typical habitats and communities. Laboratory fee, $24. (Spring, odd years)

150 Physiological Ecology (3) Wagner
Lecture (2 hours), laboratory and field (2 hours). Study of physiological adaptations of animals and plants to the abiotic and biotic environment. Prerequisite: BiSc 140. Laboratory fee, $24. (Spring, even years)

167 Radiation Biology (3) Schiff
Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals. Recommended: cell biology and chemistry or physics. (Fall)

168 Tropical Marine Biology (4) Knowlton, Packer
Study of relationships between organisms and physical, chemical, and biological factors in a tropical marine-estuarine environment, conducted through ecological field work in characteristic tropical ecosystems on the island of San Salvador, Bahamas. Laboratory investigations on organism physiology. Recommended: BiSc 103 and/or 163. Material fee, $40. (Summer, even years)

169 **Applied Marine Ecology** (4) Knowlton
Field study of interactions among biotic and abiotic components of temperate-boreal ecosystems, with emphasis on man's impact and utilization of coastal resources, conducted through surveys of ecosystems along the Maine coast and associated laboratory work, supplemented by lectures and discussion. Application of ecological and oceanographic research techniques to polluted as well as relatively unspoiled sites. Recommended: BiSc 103 and/or 140. Material fee, $40. (Summer)

171 **Undergraduate Research** (arr.) Staff
Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in Biological Science courses. Material fee, $20 per semester hour. (Fall and spring)

172 **Independent Study in Cell and Molecular Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

173 **Independent Study in Developmental Biology** (2) Brown
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

174 **Independent Study in Organismic Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

175 **Independent Study in Genetic and Evolutionary Biology** (2) Johnson, Lipscomb
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

176 **Independent Study in Environmental Biology** (2) Hufford, Merchant
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

185 **Human Nutrition** (3) Donaldson
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Fall)

Third Group

201–2 **Interdisciplinary Science** (4–4) Levy, Merchant, Parke
Joint offering of the Departments of Biological Sciences, Chemistry, and Physics. A treatment of scientific methodology and knowledge, both principles and facts. Designed to provide a basic understanding of the natural sciences and of the nature of science itself. Overview of the known fundamental principles developed in scientific observation of the physical universe. Fundamental principles are applied to systems of increasing complexity, with emphasis on physical, chemical, and biological systems. Students enrolled in natural science programs may not take this course for credit. Prerequisite: high school algebra or equivalent.

206 **Seminar: Radiation Biology** (3) Shropshire
Actions of radiation at subcellular, cellular, and organismal levels;

factors modifying radiation damage; practical considerations in radiation exposure. Prerequisite: BiSc 167 or equivalent. (Spring)

208 **Bioenergetics** (3) Merchant
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Prerequisite: BiSc 140 or equivalent. (Fall, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Lipscomb
Current problems and issues in evolution; speciation, macroevolution, biogeography, and topics of special interest to participants. (Fall, even years)

210 **Principles of Systematics** (4) Lipscomb
Lecture (3 hours), laboratory and field (2 hours). Study of taxonomy and classification of organisms. Collection of morphological, biochemical, biogeographic, and fossil data, and analysis of these data using phenetic, cladistic, and synthetic methods. Material fee, $24. Prerequisite: BiSc 108 or equivalent. (Spring, even years)

220 **Seminar: Cell or Plant Biochemistry** (3) Donaldson
Course content changes each session, alternating between selected topics in cell biochemistry and plant biochemistry. May be repeated for credit. (Spring, even years)

227 **Seminar: Genetics** (3) Johnson
Current problems in genetics. Students are required to present one seminar covering the full class period. May be repeated for credit. (Fall, odd years)

228 **Population Genetics** (3) Johnson
Consequences of Mendelian inheritance on the population level as exemplified by gene frequencies, random mating, inbreeding, differential fertility and mutations. (Fall, even years)

229 **Cytogenetics** (3) Staff
Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. Laboratory fee, $24. (Fall)

230 **Human Genetics** (3) Staff
Genetic mechanisms of transmission and expression of human traits, with emphasis on biochemical and cytogenetic aspects. Prerequisite: BiSc 127 or equivalent; previous course work in cell biology or cell biochemistry strongly recommended. (Spring)

243 **Seminar: Ecology** (3) Merchant
In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Brown
Survey of current research in selected topics in experimental morphology, biochemical development, and developmental endocrinology. Emphasis on the principles and problems of pattern formation in animals. Prerequisite: BiSc 146 or equivalent. (Fall)

249 **Seminar: Developmental Biology** (3) Brown
Discussion and reports on recent research on the endocrinological, genetic, and biochemical aspects of animal development. Prerequisite: at least one course each in developmental biology and cell biology. (Spring)

272 **Electron Microscopy** (3) Atkins, Lipscomb
Theory and practice of scanning and transmission electron micros-

copy, including specimen preparation, photography, and analysis of ultrastructural observations. Material fee, $40. (Spring)

295 **Research** (arr.) **Staff**
Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group (Applicable to Biology, Botany, and Zoology)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BOTANY

Second Group

105 **Field Biology of Woody Plants** (4) Wells
Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local and cultivated woody flora. Material fee, $20. (Fall; may be repeated for credit during the summer)

106 **Field Botany—Lower Plants** (4) **Hufford**
Lecture (2 hours), laboratory and field (4 hours). Primarily for non-specialists, emphasizing algae, mosses, and ferns. Material fee, $18. (Alternate summers)

109 **Developmental Plant Anatomy** (4) **Hufford**
Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Material fee, $20. (Spring)

110 **Comparative Plant Morphology** (4) **Hufford**
Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study and the critical roles plants have in human welfare. Material fee, $20. (Fall, even years)

125 **Flowering Plants** (4) **Wells**
Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Material fee, $20. (Spring)

133 **Economic and Etho-botany** (3) Hufford
A study of the importance of plants to humans: consideration of plants in folklore, in religion, in commerce, and as food. Narcotic, medicinal, and poisonous aspects of plants will be discussed. Material fee, $18. (Spring)

135 **Plant Physiology** (4) Donaldson
Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11–12. Recommended: Chem 50 or 151–52. Material fee, $24. (Spring, odd years)

137 **Horticulture** (4) Parker, Houston
Lecture (2 hours), laboratory (4 hours). Basic principles of growth, propagation, and care of ornamental plants. Material fee, $20. (Fall and spring)

141 Plant Ecology (4) — Wells
Lecture (2 hours), laboratory (4 hours). Several Saturday and weekend field trips required. Material fee, $18. (Fall)

149 Freshwater Algae (4) — Hufford
Observation and discussion (6 hours). Systematics, morphology, physiology, and water quality interrelationships of freshwater algae. Field experience, including at least one weekend field trip. Material fee, $18. (Fall, odd years)

Third Group

221 Seminar: Systematics of Flowering Plants (3) — Wells
Review of current work in various disciplines of systematic research; topics of special interest to participants. May be repeated for credit. (Spring, odd years)

238 Seminar: Current Topics in Phycology (3) — Hufford
(Spring, odd years)

242 Seminar: Plant Ecology (3) — Wells
(Spring, even years)

299–300 Thesis Research (3–3) — Staff
(Fall and spring)

ZOOLOGY

Second Group

101 Invertebrate Zoology (4) — Knowlton
Lecture (2 hours), laboratory (4 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Material fee, $24. (Fall)

102 Advanced Invertebrate Zoology (4) — Knowlton
Lecture (2 hours), laboratory and field (4 hours). Study of invertebrate systems (cells, tissues, organs, organisms), with emphasis on functional aspects (physiology and ecology) and taxonomy of important groups. Prerequisite: BiSc 101 or equivalent. Material fee, $24. (Spring, odd years)

104 Comparative Vertebrate Anatomy (4) — Atkins
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $24. (Fall; spring, odd years)

120 Animal Behavior (3) — Grow
Principles of animal behavior, including mechanisms and manifestations from simple reflex systems to social interaction. (Spring)

143 Animal Ecology (4) — Merchant
Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $24. (Spring, even years)

145 Principles of Development (4) — Brown
(Formerly Introduction to Vertebrate Embryology)
Lecture (2 hours), laboratory (4 hours). Development of animals, especially vertebrates, with reference to human embryos. Principles are illustrated by modern experimental studies of developmental problems. Laboratory analysis of organ system formation in the frog, chick, and pig. Material fee, $24. (Fall; spring, even years)

146 **Experimental Developmental Biology** (4) Brown
Lecture (2 hours), laboratory (4 hours). Molecular and cellular biology of development through examination of the literature and complementary laboratory experiments. Laboratory exercises involve micromanipulative and biochemical operations on embryos fertilized in the lab. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology. Laboratory fee, $24. (Spring, odd years)

148 **Histology** (4) **Burns**
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24. (Spring; fall, odd years)

153 **Survey of Neurobiology** (4) **Atkins**
Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Prerequisite: BiSc 104. Material fee, $24. (Fall)

155 **Parasitology** (4) Eckerlin
Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Material fee, $20. (Fall)

156 **Ichthyology** (4) Burns
General biology of fishes, including structure, function, distribution and evolution, with emphasis on adaptations. Prerequisite: background in comparative anatomy and vertebrate zoology, or permission of instructor. Lecture (3 hours), laboratory (2 hours). Material fee, $20. (Fall, even years)

157 **Comparative Endocrinology** (4) Burns
Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuro-endocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 165 and/or concurrent registration in Chem 151–52 or Chem 50. Material fee, $24. (Fall)

163 **Human Physiology** (3) **Packer**
Introduction to the function of organ systems of the human body. (Fall)

164 **Human Physiology Laboratory** (1) **Packer**
Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $28. (Fall)

165 **Advanced Human Physiology** (4) Packer
(Formerly Vertebrate Physiology)
Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $28. (Spring)

Third Group

204 **Seminar: Invertebrate Zoology** (3) **Knowlton**
Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. (Fall)

211 **Parasites and Evolutionary Biology** (3) Lipscomb
(Formerly Adaptation and Natural Selection)
Study of the adaptations and evolution of parasites, including co-

evolution of parasites and hosts, competition for hosts, evolution of life cycles, and topics of special interest to participants. (Fall, odd years)

212 **Seminar in Comparative Reproductive Biology** (3) Burns
Review of selected topics in animal reproduction, including neuroendocrine regulation, reproductive cycles and behavior, and gonadal pathology. (Spring)

252 **Seminar: Neurobiology** (3) **Atkins**
Study of current publications in comparative neurobiology. May be repeated for credit with instructor's permission. (Spring, even years)

253 **Evolution of the Nervous System** (4) Atkins
Invertebrate and vertebrate nervous systems. The development of increasing complexity in neurons and systems of neurons, and the establishment of alternate pathways to accomplish particular functions. Lecture and laboratory. Prerequisite: BiSc 153. Material fee, $24. (Spring, odd years)

256 **Fish Physiology** (3) Packer
A survey of major organ systems and homeostatic mechanisms of fishes with emphasis on teleosts. Prerequisite: BiSc 163 or 156 or equivalent. (Spring, odd years)

265 **Comparative Environmental Physiology** (3) Packer
Survey of the physiological basis of adaptation of animals to diverse environments, emphasis on nonmammalian vertebrates. Prerequisite: BiSc 165 or equivalent. (Fall)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

BUSINESS ADMINISTRATION

Professors R.B. Eastin, H.R. Page *(Emeritus)*, F. Amling, G. Black, P.D. Grub, G.P. Lauter, N.M. Loeser, A. El-Ansary, B. Burdetsky *(Chairman)*, S.F. Divita, R. Eldridge, R.F. Dyer, W.C. Handorf, S.N. Sherman, W.J. Winstead *(Visiting)*, F. Ghadar, Y.S. Park

Professorial Lecturers G.M. Arnaoot, J.P. Murphy, S.C. Silverberg, S. Thurm, S.A. Seelig, D.A. Peterson, D.H. Watts

Associate Professors R.L. Holland, H.J. Davis, E.L. Hullander, J.M. Sachlis, P.B. Malone III, D.J. Lenn

Associate Professorial Lecturers J.T. Heisler, J.H. Joseph, A.C. Meiners, Jr., A.G. Pieruccini, C.W. Richards, J.T. Heimbach

Assistant Professors T.M. Barnhill, D.R. Kane, N.G. Cohen, M.L. Liebrenz, L.M. Maddox, J.B. Thurman, P.S. Peyser, M.S. Katzman, W. Margrabe, C.C. Shepherd, Jr., E.J. Englander, C.J. Prager *(Visiting)*

Assistant Professorial Lecturers M.W. Hudgins, M.J. Moran, M.A. Regalia, J.M. Talens, D.E. Laufenberg, R.A. Beverage, D.E. Kreps, S.M. Mallamad, R.R. Pariseau, Y. Lee

Lecturers R.M. Eldridge, G.I. Friend, G.S. Thomas, A. Akonie III, B.A. McKinney

See the School of Government and Business Administration for programs of study in business administration leading to the degrees of *Bachelor of Business Administration, Master of Business Administration, and Doctor of Business Administration.*

First Group

51 **Introduction to Business** (3) Davis, Katzman, Thurman
Structure, activities, and problems of business enterprise; its contribution to the individual and to society; careers in business. (Fall and spring)

Second Group

101 **The Business Environment** (3) Lenn, Englander
Economic and legal environment of business enterprise; social and political influences; contemporary problems and issues. Restricted to seniors in the BBA program. (Fall and spring)

104 **Commercial Law** (3) Shepherd
(Formerly BAd 161)
Fundamental concepts and principles of law encountered in commercial activity; contracts, sales bailments, agency, negotiable instruments, real and personal property, bankruptcy; other topics. Basic legal considerations in business decision making. (Fall and spring)

110 **Personnel Management** (3) Burdetsky, Malone
(Formerly BAd 105)
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)

115 **Leadership in Personnel Management** (3) Burdetsky
(Formerly BAd 106)
A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 110. (Fall)

117 **Collective Bargaining** (3) Burdetsky
(Formerly BAd 107)
American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 110. (Spring)

120 **Business Finance** (3) Handorf, Barnhill, Sachlis, Cohen
(Formerly BAd 131)
Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, and cost of capital. Prerequisite: Acct 51–52; Econ 1; Math 51–52; Stat 51. (Fall and spring)

123 **Investment and Portfolio Management** (3) Amling, Cohen
(Formerly BAd 138)
Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: BAd 120.

124 **Advanced Financial Management** (3) Handorf, Barnhill
(Formerly BAd 139)
Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financings, dividend policy, and other special topics in finance. Prerequisite: BAd 120.

130 **Working Capital Management** (3) Margrabe, Cohen
(Formerly BAd 134)
The analysis of corporate short-term sources and uses of funds. Optimization techniques and case studies emphasized. Bank lending

practices are evaluated within the working capital area. Prerequisite: BAd 120. (Spring)

132 **Real Estate Investment** (3) Handorf
(Formerly BAd 113)
Principles of real estate investment including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 120. (Fall)

133 **Fundamentals of Insurance and Risk Management** (3) Cohen
(Formerly BAd 121)
Functions of insurance and risk management in business enterprise. (Spring)

135 **Capital Formation** (3) Handorf
(Formerly BAd 133)
The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 120. (Spring)

140 **Basic Marketing Management** (3) El-Ansary, Liebrenz, Maddox, Friend
(Formerly BAd 141)
Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2, Stat 51. (Fall and spring)

142 **Consumer Behavior** (3) Dyer, Maddox
(Formerly BAd 146)
An examination of the social, cultural, and psychological factors influencing the behavior of consumers. Topics include: models of buyer behavior, consumption patterns, market segmentation research, attitude formation and change, brand loyalty, the adoption of innovations, and store choice decisions. Marketing management and public policy implications of consumer research studies are stressed. Prerequisite: BAd 140. (Fall and spring)

143 **Marketing Research** (3) Dyer
Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: attitude research, questionnaire construction and concept testing. Prerequisite: BAd 140, Stat 51, Mgt 118. (Fall and spring)

148 **Advertising** (3) Maddox, Dyer, Thurm
(Formerly BAd 147)
Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools, including personal selling and sales promotion, presented. Prerequisite: BAd 140, 142, 143. (Fall and spring)

149 **Advanced Advertising Campaigns** (3) Maddox
An application of the principles of marketing and advertising to a real-world situation in the development of an advertising campaign. Students work in an advertising agency atmosphere to perform tasks including situation analysis, market segmentation, marketing research, media selection, and copywriting in the preparation of the advertising campaign. The culmination is the presentation of the campaign at a national competition sponsored by the American Advertising Federa-

tion. Five students from the class will be selected as presenters. Prerequisite: BAd 140, 142, 143, 148, or permission of instructor. (Fall and spring)

150 **Salesmanship and Sales Management** (3) Liebrenz, Divita
(Formerly BAd 145)
Organization of sales department, sales planning and forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 140, 142, 143. (Fall)

152 **Retailing Management** (3) El-Ansary
(Formerly BAd 148)
A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations and case analyses. Prerequisite: BAd 120, 140, 142, 143. (Spring)

154 **Transportation and Logistics Management** (3) Sherman
(Formerly BAd 171)
Systems and alternatives of the logistics manager; carrier, user, and public policy perspectives; urban and inter-city mobility; cost, rate, competition, and service problems; public financing and regulation of carrier enterprise; coordination of the modes of transportation. (Fall)

159 **Marketing: Strategic Planning** (3) Divita, El-Ansary
(Formerly BAd 149)
A capstone seminar for marketing majors. Analytical integration of material covered in previous marketing courses. Marketing strategy literature, financial dimensions of marketing management, and comprehensive cases. Prerequisite: BAd 140, 142, 143, 150, and one additional marketing major field course. (Spring)

160 **Introduction to International Business** (3) Grub, Pieruccini
(Formerly BAd 175)
Social, cultural, political, legal, and technological environment of multinational business, emphasizing host-government/multinational corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation, and legal requirements; physical movement of goods in international business. (Fall and spring)

166 **International Marketing Management** (3) Lauter, El-Ansary, Liebrenz
(Formerly BAd 144)
Scope of international markets; factors in assessing world marketing opportunities; international marketing product, pricing, distribution, and promotion program development in dynamic world markets and global environment. Prerequisite: BAd 140. (Fall and spring)

168 **Foreign Market Analysis** (3) Grub
Patterns of world trade by country, commodities, and products; selected regional analyses, in-depth market studies. Prerequisite: BAd 160, 166. (Fall and spring)

171 **International Business Finance** (3) Eldridge, Hudgins
(Formerly BAd 132)
Analysis of the international economic environment and its influence on corporate financial management of international operations. (Fall and spring)

173 **International Banking** (3) Ghadar, Park
Theory and practice of international banking; analysis of international commercial and investment banking from a management perspective; subjects include current international monetary and financial environment, money in capital markets, and topical problems of international banking from a management perspective. Prerequisite: BAd 171. (Fall and spring)

175 **International Monetary and Financial Issues** (3) Ghadar, Eldridge, Park
International macro- and micro-issues of money, banking, and finance. Interrelationship, from a management perspective, of basic forces shaping international and financial policy. Topics include international monetary systems, Eurocurrency markets, LDC debt crises, role of the International Monetary Fund and World Bank, and development banking issues. For advanced undergraduate students with a background in international business finance. Prerequisite: BAd 171, 173, or permission of instructor. (Fall and spring)

190 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods.

191 **Fundamentals of Management** (3) Davis, Malone, Thurman, Katzman
(Formerly BAd 102)
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking. (Fall and spring)

192 **Small-Business Management** (3) Staff
(Formerly BAd 182)
Theory and practice of small business management. Focus on effective management of small firms, essentials of planning and organizing the firm, financial and administrative controls, evaluation of alternative business forms, and comparison of purchase of an on-going firm, franchising, and new business start-ups. The role of small business in American society; historical perspective of entrepreneurship. Prerequisite: BAd 191.

193 **Managing Production/Operations** (3) Hullander, Holland
(Formerly BAd 181, Manufacturing Production)
Basic principles and methods of manufacturing production. Manufacturing facilities, plant and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent; BAd 110, 191. Restricted to seniors in the BBA program. (Fall and spring)

198 **Business Policy and Administration** (3) Thurman, Katzman, Malone
Integration of functional activities in arriving at overall business policy decisions. Prerequisite: BAd 110, 120, 140, 191, 193. Restricted to seniors in the BBA program. (Fall and spring)

199 **Individual Research** (arr.)
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

Third Group

201 **Social and Legal Environment of Business** (3) Kane
This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Contemporary social forces acting on business management; business responsibility,

ethics. The American legal system, federal regulation, constitutional and administrative law. Business and public policy. Emphasis on court decisions relating to business. (Fall and spring)

202 **Business-Government Relations** (3) Black
Economic, political, and philosophical foundations of the business-government relationship in theory and practice. Antitrust, public utility, and other regulation, consumer and environmental protection, conditions of employment; effective business response—present status and future prospects. Prerequisite: BAd 201 or equivalent. (Fall and spring)

203 **Federal Government Regulation of Society** (3) Tolchin
(Formerly BAd 216)
Same as PAd 216.

204 **Regulation of Business: Administrative Law** (3) Staff
(Formerly BAd 203)
Principles of federal regulation of business through administrative bodies. Analysis of sources and limits of the powers and prerogatives of administrative bodies in adjudicative, executive, and rule-making functions. Theoretical and practical aspects of regulations; other topics. Prerequisite: BAd 201, 202 or equivalent. (Fall)

205 **Business Representation and Lobbying** (3) Joseph
Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agencies of the federal government. Legal and practical constraints. Ethical considerations. (Fall)

206 **Applied Microeconomics** (3) Black, Holland
(Formerly BAd 261)
Applications of economic theory to public and private decisions affected by the economic and general business environment. Demand, production, costs, profits, investments, inventory, market structure. Prerequisite: Econ 217 and Mgt 270 or equivalents. (Spring)

208 **Macroeconomic Policy and Business** (3) Black
(Formerly BAd 262)
Interpretation of economic conditions in the short- and long-run; theory and practice of monetary and fiscal policy; applications of business conditions analysis to business planning, management, and policy. Prerequisite: Econ 218 and Mgt 270 or equivalents. (Fall)

209 **Seminar: Business Economics and Public Policy** (3) Black
(Formerly BAd 206)
Analysis and discussion of selected issues by students and representatives of government and business. Prerequisite: BAd 201, 202, or equivalent.

210 **Personnel Management** (3) Eastin, Loeser, Malone
(Formerly BAd 208)
Survey of personnel management practices and procedures, including labor-management relations. (Fall and spring)

211 **Seminar: Personnel Management** (3) Eastin
(Formerly BAd 209)
Industrial personnel and manpower management, research in advanced problems. (Spring)

212 **The Personnel Manager** (3) Eastin
(Formerly BAd 210)
The personnel manager and his or her place in the organization, relation to other executives, policy role and relations with chief

executive. Problems of the senior personnel executive. Prerequisite: BAd 210 or permission of instructor.

215 **Leadership and Executive Development** (3) Loeser, Malone
(Formerly BAd 211)
Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite: Mgt 205 or permission of instructor. (Fall and spring)

217 **Unionism and Collective Bargaining** (3) Burdetsky
(Formerly BAd 212)
The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

218 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky
(Formerly BAd 213)
Current problems and issues. Prerequisite: BAd 217. (Spring)

220 **Business Financial Management** (3) Barnhill, Cohen, Peyser, Margrabe
(Formerly BAd 230)
This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital planning, and budgeting. Prerequisite: Acct 201, Econ 217, Mgt 218 and 270, or equivalents. (Fall and spring)

221 **Financial Decision-making** (3) Sachlis, Peyser, Margrabe
(Formerly BAd 231)
Theory and practice of business finance, emphasizing the impacts of long- and short-term uses and sources of funds on the firm's value. Prerequisite: BAd 120 or 220. (Fall and spring)

222 **Seminar: Capital Formation** (3) Handorf, Moran, Regalia
(Formerly BAd 234)
Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 120 or 220. (Fall and spring)

223 **Investment Analysis** (3) Amling, Cohen
(Formerly BAd 237)
Risk-reward analysis of security investments including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 120 or 220. (Fall and spring)

224 **Financial Management** (3) Cohen, Barnhill
(Formerly BAd 235)
Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 221. (Fall and spring)

231 **Seminar: Investment and Portfolio Management** (3) Amling
(Formerly BAd 238)
Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 223.

232 **Real Estate Finance** (3) Seelig
Investment in and financing of real estate from the points of view of the developer, investor, borrower, and lender. Emphasizes vocabulary and identification of significant issues. Develops key analytical tools. Prerequisite: BAd 230. (Spring)

239 **Financial Theory** (3) Sachlis
In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy and the capital asset pricing framework. Prerequisite: BAd 221, 223.

240 **Marketing Management** (3) Dyer, Divita, El-Ansary, Liebrenz
This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level Requirement. Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision-making; developing an integrated marketing plan. Prerequisite: Econ 217–18. (Fall and spring)

241 **Advanced Marketing Management** (3) Divita, Liebrenz
For MBA students in concentrations other than marketing. Case analysis of complex marketing problems. Current developments in marketing practice. The relationship of marketing to environmental forces and other business functions. Prerequisite: BAd 240. (Fall and spring)

242 **Buyer Behavior** (3) Dyer, Maddox, Heisler
(Formerly BAd 246)
Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. Prerequisite: BAd 240 or permission of instructor.

243 **Marketing Research** (3) Dyer
The marketing research process: designing, conducting, and using market research studies. Survey and experimental designs. Data analysis with statistical software packages. Prerequisite: BAd 240, Mgt 218 and 270, or equivalent. (Fall and spring)

246 **Product/Service Strategy** (3) Dyer
(Formerly BAd 242)
Management of the activities involved in marketing new and existing products and services. The innovation system (behavioral and organizational) of product decisions, product planning processes, product auditing, new products and the law, new product/service trends. Marketing of intangibles and services. Prerequisite: BAd 240, 242, 243. (Spring)

248 **Advertising and Sales Promotion** (3) Dyer, Maddox
(Formerly BAd 245, Promotion Management/Marketing Communications)
Examination of advertising and sales promotion from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 240, 242, 243. (Spring)

250 **Selling and Sales Management** (3) Divita
The sales function from both the viewpoint of the sales person and

the sales manager. The first part of the course will focus on the selling task, with attention to ethical and legal issues, the selling process, human behavior and selling, account management and internal selling, negotiation and non-selling aspects of sales work. The second part of the course will focus on the managerial issues associated with sales management, with attention to demand analysis and resource allocation, financial planning, quota setting and control, motivation, coaching and incentives, sales administration, and analysis of sales performance. (Spring)

253 **Marketing Channels** (3) El-Ansary

Marketing channels and vertical marketing systems from a managerial viewpoint. Marketing channels viewed as super-organizations requiring planning, organization, coordination, and control. These tasks require an understanding of the channel's task environment, manufacturing, wholesaling, retailing, and physical distribution institutions. Focus on system performance and management of interorganizational relationships among channel institutions. Prerequisite: BAd 240. (Fall)

257 **Marketing and Public Policy** (3) Divita

(Formerly BAd 247)

Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government business and advocate viewpoints presented. Prerequisite: BAd 240, 242, or 248; or permission of instructor. (Fall)

259 **Marketing Strategy** (3) Divita, El-Ansary

(Formerly BAd 249)

Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: completion of at least three Second-Level marketing courses or permission of instructor. (Fall and spring)

261 **Multinational Corporations in the World Economy** (3) Ghadar, Park, Grub

(Formerly BAd 255)

Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring)

262 **Seminar: International Trade** (3) Eldridge

(Formerly BAd 256)

Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues. (Fall and spring)

263 **Legal Aspects of International and Multinational Business** (3) Petersen

(Formerly BAd 204)

Legal environment of international and multinational business including legal systems, antitrust laws, regulation of direct investment, international arbitration and expropriation; topics of current interest. (Fall and spring)

266 **International Marketing** (3) Lauter, El-Ansary, Liebrenz

(Formerly BAd 248)

Organizational structures. Analysis of international markets. Market-entry strategies and product policies. Special issues. Channels of

distribution, promotional and price policies. Prerequisite: BAd 240. (Fall and spring)

267 **Regional International Marketing Systems** (3) Lauter
(Formerly BAd 254)
Discussion of the political, economic, legal, and social characteristics of Europe, Japan, Latin America, Asia, the Middle East, Africa, the USSR, Eastern Europe, and China, as they affect the marketing of goods and services in these regions. Identification of appropriate market-entry strategies and discussion of selected case histories. Prerequisite: BAd 240, 266. (Fall and spring)

271 **International Business Finance** (3) Ghadar, Park, Arnaoot
(Formerly BAd 233)
Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 120 or 220. (Fall and spring)

273 **Seminar: International Banking** (3) Park, Ghadar
(Formerly BAd 236)
International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions and the effect of international banks on national monetary policies. Prerequisite: BAd 222, 271. (Fall and spring)

275 **External Development Financing** (3) Ghadar, Park
(Formerly BAd 258)
Problems and alternative solutions for required capital formation and the financing of payment imbalances through external sources. Institutions and instruments for financing national development. Emphasis on planning as affected by energy policies, inflation, recession, changes in the international monetary system and revised attitudes among developed countries regarding bilateral and multilateral assistance. Prerequisite: BAd 271 or permission of instructor. (Fall and spring)

276 **Seminar: International Financial Markets** (3) Park
Theory and practice of international financial markets. Operation and structure of the Eurocurrency market, such as interbank operations, Eurodollar CDs, and floating-rate Eurocredits. Control of the Eurocurrency market and the role of other financial centers. Study of Eurobond and floating-rate note markets as well as major foreign bond markets. Prerequisite: BAd 271 or 273. (Fall and spring)

278 **International Business Negotiations** (3) Ghadar
(Formerly BAd 259)
This course focuses on the essential characteristics of International Business Negotiations (IBN) with particular emphasis on the process and changes in that process over time. Formulation of concepts and preliminary frameworks to assist in understanding IBN; development of systematic approaches to planning for and conducting IBN. The course assists in developing skills of the participants in the art of IBN while integrating other functional and international aspects in the broader environmental framework. Prerequisite: BAd 261. (Fall and spring)

280 **Purchasing and Materials Management** (3) Sherman
(Formerly BAd 279)
Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics. Same as PAd 280. (Fall and spring)

281 **Procurement and Contracting** (3) Sherman
(Formerly BAd 280)
Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. Same as PAd 281. (Fall and spring)

282 **Government Contract Administration** (3) Sherman
Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Same as PAd 282. (Spring)

283 **Pricing and Negotiation** (3) Sherman
Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Prerequisite: permission of instructor. Same as PAd 283. (Fall)

285 **Systems Procurement and Project Management** (3) Sherman
Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Analysis of cases in public and private sector contractural or assistance activities. Same as PAd 285. (Fall and spring)

290 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

292 **New Venture Initiation** (3) Staff
Theory and practice of entrepreneurship and small business management. Historical perspective of entrepreneurship in the U.S. and abroad, essentials of planning a new business venture, sources of financing, evaluation of alternative new business ventures, and analysis of business functions needed to get started. On-going firms, franchising options, and new business start-ups. Prerequisite: Mgt 218, 270; Econ 217–18; BAd 201, 220, 240; Acct 201. (Fall and spring)

293 **Manufacturing Policy and Strategy** (3) Hullander
(Formerly Operations and Logistics Management)
Management of work in production, commercial, service, and public organizations. Analytical tools for planning and establishing operating systems and for their operation, control, and modification. Examination of processes, products, services, equipment, and facilities. Relationships of human systems and operating systems. Prerequisite: Acct 201; Mgt 218, 270; Econ 217–18; BAd 201, 220, 240. (Fall)

295 **Research Methods** (3) Davis
Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. Use of computer library programs and preparation of a formal business report. (Fall)

297 **Business Policy Formulation** (3) Eastin, Davis
This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Analysis of operational situations and policy issues. Developing and implementing solutions to managerial problems. Prerequisite: advanced master's degree standing and completion of at least eight Second-Level MBA courses. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) — **Staff**
Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) — **Staff**
Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) — **Staff**
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) — Eldridge
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

321 **Seminar: Financial Markets** (3) — Sachlis, Peyser, Margrabe
(Formerly BAd 331)
Research seminar in corporate financial theory, investment portfolio theory, and capital market theory. May be repeated once for credit. Prerequisite: BAd 222, 231, 239.

341 **Seminar: Marketing** (3) — **El-Ansary, Dyer**
Examination of major theoretical developments in marketing. Topics include advances in research methods, models and data analysis. Emphasis on emerging concepts in consumer behavior, channels, marketing communication and marketing information systems.

361 **Colloquium on International Business** (3) — Eldridge, Grub
(Formerly BAd 358)
Examination of selected topics in international business, with emphasis on major new theoretical and empirical developments. (Fall)

381 **Seminar: Materials and Operations Management** (3) — Sherman
Recent developments in manufacturing production and materials management; impact of technological, economic and social change; significant related trends. Private and public sector policy implications. New and emerging analysis techniques. Prerequisite: BAd 280, 281, or permission of instructor.

391 **Seminar: Business Management** (3) — Burdetsky, Eastin
Examination of major current issues, both theoretical and empirical, affecting the development of the business enterprise. Topics to be announced. Emphasis on policy and strategic issues affecting the total enterprise.

398 **Advanced Reading and Research** (arr.) — Staff
Limited to students preparing for the Doctor of Business Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) — Staff
Limited to Doctor of Business Administration candidates. May be repeated for credit.

CARTOGRAPHY

See **Geography and Regional Science.**

CHEMICAL TOXICOLOGY

See **Forensic Sciences.**

CHEMISTRY

Professors T.P. Perros *(Chairman)*, W.E. Schmidt, D.G. White, J.B. Levy, N. Filipescu, A.D. Britt, E.A. Caress, D.A. Rowley, D. Ramaker
Associate Professors M. King, A. Montaser
Assistant Professor J.H. Miller

Bachelor of Arts or Bachelor of Science with a major in chemistry (departmental)—The department offers two undergraduate majors designed to give students broad training in the basic divisions of chemistry: analytical, inorganic, organic, and physical. *Major I* provides considerable concentration in chemistry. However, it permits a wider selection of electives and thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. *Major II* is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. One foreign language (Russian, Japanese, German, or French) is recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for Major I and Major II—Chem 11–12 and 22, or 15–16; Math 30, 31; Phys 1 and 2 or 14 and 15.

3. (a) Required courses for Major I—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 134, 141, 151–52, 153–54.

(b) Required courses for Major II—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only): Chem 111–12, 113–14, 122, 141–42 (or 156 in lieu of 142), 151–52, 153–54, 235; Math 32; Stat 197; one course selected from Chem 195, 207, 213, 221, 222, 251; ForS 240, 242; Math 111, 139; Phys 161, 165, 175.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry as evaluated by the faculty.

Bachelor of Science/Master of Science in the field of chemical toxicology—This is a five-year program leading to the B.S. in the field of chemistry and the M.S. in the field of chemical toxicology. The first three years of the program consist of undergraduate course work. Application for admission to the M.S. program in chemical toxicology will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program acceptance must be obtained prior to the start of the fourth year of the program. If acceptance into the M.S. program in chemical toxicology is not desired or not obtained, the requirements for the

B.S. in chemistry, either Major I or II, may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.S. program in chemical toxicology is obtained, the B.S. in chemistry will be awarded after the successful completion of the fourth year of the program.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Course requirements: Chem 11–12, 22, 111–12, 113, 114, 122, 134, 141–42, 151–52, 153–54; Phys 1, 2; BiSc 11–12, 129; Math 30, 31, 32; Stat 127; Bioc 221-22, Phys 191 (for graduate credit); Phar 203; ForS 240, 242, 245; either ForS or Chem 299–300; and two courses chosen from ForS 246, 248, 249, 269.

3. Twelve semester hours of a foreign language are recommended.

Minor in Chemistry—Required: Chem 11–12, 22, 50, and 111; Chem 151, 152, 153, or 154 may be substituted for Chem 50.

Master of Science in the field of chemistry—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The required 30 semester hours of graduate work must include Chem 213 and 221, and at least two of the following: Chem 207, 236, and 251. The thesis requirement, Chem 299–300, may be in analytical, inorganic, organic, or physical chemistry. Chem 156, or its equivalent, is prerequisite to research work in the field of organic chemistry. A reading knowledge examination in German or Russian must be passed, or proficiency in computer programming must be demonstrated. A student who intends to become a doctoral candidate is strongly urged to take Chem 207 as early as possible in the master's program.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Prerequisite: a bachelor's degree with a major in chemistry or in geology from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111-12, 213, and 299-300, and Geol 141, 241, and 249. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Department of Chemistry or Geology must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Doctor of Philosophy in the field of chemistry—Required: the general requirements stated under the Graduate School of Arts and Sciences. Chem 207, 213, 221, 235, 251, and 350 are normally required of the doctoral student, in addition to other courses as determined by consultation with the departmental program committee. A reading knowledge examination in German or Russian must be passed, and proficiency in computer programming must be demonstrated. Cumulative examinations replace the General Examination requirement.

Research fields: analytical chemistry, inorganic chemistry, organic chemistry, physical chemistry (electrochemistry, kinetics, magnetic resonance, theoretical), physical organic chemistry (reaction mechanisms), and structure and synthesis of natural products.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Research (Chem 399) in the form of course work jointly approved by the Chemistry

Department and the Graduate Program in Science, Technology, and Public Policy. The purpose of this option is to provide a useful background for chemistry doctoral students who may be employed in government agencies dealing with science, technology, and public policy programs. The 12 hours may be selected from the following courses: PSc 222, 223, 252, 203, 217; PAd 214, 260; Mgt 233, 234.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Required: the general requirements stated under the Graduate School of Arts and Sciences, including a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

Bachelor of Arts in Education and Human Development with a teaching field in chemistry—Prerequisite: the education curriculum; required: the chemistry option and professional courses stated under the School of Education and Human Development.

Graduate Placement Examinations: All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the department of chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

All graduate students are required to participate in the seminar and colloquium programs.

Registration: Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation and laboratory sections. The work of the junior and senior years must be approved by the department.

PHYSICAL SCIENCE

First Group

3–4 Contemporary Science for Nonscience Majors (3–3) Filipescu

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester. **(Academic year)**

CHEMISTRY

First Group

11–12 General Chemistry (4–4) Britt, Perros, Rowley, White

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $35 per semester. **(Chem 11 and 12—fall and spring)**

13 General Chemistry (4) **Britt**
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration: Math 31, Phys 14 or 15. Laboratory fee, $35. (Fall and spring)

15–16 Intensive General and Analytical Chemistry (4–4) Staff
(Honors Course)
Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour). Equivalent to Chem 11–12 and 22, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $35 per semester. (Academic year)

22 Introductory Quantitative Analysis (4) Staff
Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical and modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Prerequisite: Chem 12. Laboratory fee, $35. (Fall and spring)

50 Introduction to Organic Chemistry (4) **Caress**
Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Prerequisite: Chem 12 or 16. Laboratory fee, $35. (Spring)

Second Group

110 Introduction to Physical Chemistry (3) Levy
Topics include chemical thermodynamics, chemical kinetics, electrochemistry, solution chemistry, membrane and phase equilibria, and others. Prerequisite: Chem 16 or 22, Math 31, Phys 2; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111–12 or an equivalent course. (Summer)

111–12 Physical Chemistry (3–3) Miller, Ramaker
Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids, liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 or 22; Math 31; Phys 2 or 15. Prerequisite to Chem 112: Chem 111. (Academic year)

113 Physical Chemistry Laboratory (2) Miller, Ramaker, Schmidt
Laboratory complement to Chem 111. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $35. (Fall)

114 Instrumental Analysis Laboratory (2) Miller, Ramaker, Schmidt
Laboratory complement to Chem 112 and 122. Prerequisite or concurrent registration: Chem 112, 113, and 122. Laboratory fee, $35. (Spring)

122 Instrumental Analysis (3) Montaser
Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, with emphasis on electroanalysis, atomic and molecular spectrophotometry, mass spectrometry, and chromatography. Correlated with Chem 114. Prerequisite or concurrent registration: Chem 112. (Spring)

134 Descriptive Inorganic Chemistry (2) **Perros**
Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16 or 22, 152. (Fall)

141–42 Advanced Experimental Chemistry (2–2) **White, Caress**
Designed to provide the chemistry major with facility in experimental methods common to all disciplines of chemistry. Prerequisite: Chem 154. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $35 per semester. (Academic year)

151–52 Organic Chemistry (3–3) **Levy, King**
Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 Organic Chemistry Laboratory (1–1) **Staff**
Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

156 Qualitative Organic Analysis (3) **King**
Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and/or others as appropriate; identification of their components using spectroscopic techniques. Lecture emphasizes the practical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22, 154. Laboratory fee, $35. (Spring, odd years)

191 History of Chemistry (2) **Perros**
Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12 or 16. (Spring)

193 Chemical Instrumentation (3) **Montaser**
Lecture (2 hours), laboratory (3 hours). Electronic analog measurements and control of electrical quantities in chemical instrumentation; digital and analog data conversion and optimization of electronic measurements in chemical instrumentation. Prerequisite: Chem 112 and 114 or permission of instructor. Laboratory fee, $10.

195 Undergraduate Research (1 or 2) **Staff**
Research on problems approved by the staff. Approval must be obtained prior to registration. May be repeated once for credit. Laboratory fee, $35 per semester hour. (Fall and spring)

Third Group

201-2 Interdisciplinary Science (4–4) **Levy, Merchant, Parke**
Joint offering of the Departments of Biological Sciences, Chemistry, and Physics. A treatment of scientific methodology and knowledge, both principles and facts. Designed to provide a basic understanding of the natural sciences and of the nature of science itself. Overview of the known fundamental principles developed in scientific observation of the physical universe. Fundamental principles are applied to systems of increasing complexity, with emphasis on physical, chemical, and biological systems. Students enrolled in natural science programs may not take this course for credit. Prerequisite: high school algebra or equivalent.

205 Environmental Science and Technology (3)
Chemistry and physics of environmental pollution; emphasis on water and air pollution. Instrumental techniques and their limitations. Students present papers emphasizing chemical and physical aspects of an environmental pollutant. Offered off campus.

207 Chemical Bonding (3) **Ramaker**
Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. (Fall)

211–12 Physical Chemistry (2–1) Miller, Ramaker
Same as Chem 111 12. Admission only by departmental permission. Credit assigned upon satisfactory completion of Chem 213. (Academic year)

213 Chemical Thermodynamics (3) Miller
Application of thermodynamics to chemical problems. Emphasis on statistical calculation of thermodynamic properties. Prerequisite: Chem 112 or 212. (Spring)

216 Statistical Mechanics (3) **Ramaker**
Introduction to classical and quantum statistics designed to acquaint students with basic principles and methods. Prerequisite or concurrent registration: Chem 207 or permission of instructor. (Offered as the demand requires)

218 Molecular Spectroscopy (3) **Ramaker**
Applications of quantum chemistry, molecular orbital theory, valence bond theory, vibration and rotation of molecules, IR and electronic spectroscopy. Prerequisite: Chem 207. (Spring, odd years)

221 Advanced Analytical Chemistry I (3) Montaser
Theory and application of recent spectrometric methods of analysis, including electrical, magnetic, and optical instrumentation, X-ray methods, and surface analysis techniques. Prerequisite: Chem 122. (Fall)

222 Advanced Analytical Chemistry II (2 or 3) **Schmidt**
Lecture (2 hours), laboratory (3 hours—optional). Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. Laboratory fee, $21. (Spring, even years)

233 Organometallic Chemistry (3) **White**
Survey of organometallic compounds with emphasis on the compounds of lithium, boron, aluminum, silicon, the transition metals, and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)

235–36 Advanced Inorganic Chemistry (3–3) **Rowley**
Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)

251–52 Advanced Organic Chemistry (3–3) **Filipescu**
Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)

257 Physical-Organic Chemistry (3) **Levy**
The transition state theory of chemical kinetics, applications to reaction mechanisms; kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward-Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)

258 Synthesis and Structure Determination in Organic Chemistry (3) **Caress**
Spectroscopic methods of structure determination; the design of synthesis for complex organic molecules. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)

259 Polymer Chemistry (3) **Barkin**
A study of the preparation, properties, and structure of macromolecules. Prerequisite: Chemistry 152 and 111 or permission of instructor. (Fall)

295 Research (arr.) **Staff**
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $35 per semester hour. (Fall and spring)

299–300 Thesis Research (3–3) **Staff**
(Fall and spring)

Fourth Group

350 Choice and Design of a Research Problem (1) **Staff**
Development in written form of an original research plan, fully referenced, and its oral defense. If a grade of C is received, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)

398 Advanced Reading and Research (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

CHINESE

See **East Asian Languages and Literatures.**

CLASSICS

Associate Professors J.E. Ziolkowski *(Chairman)*, E.A. Fisher
Associate Professorial Lecturer M.E. Norton
Assistant Professor M.D. Ticktin
Assistant Professorial Lecturer Y.M. Moses

Bachelor of Arts with a major in classical humanities (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—Clas 1–2, 3, 4; or equivalent; or Clas 11–12, 13–14; or equivalent; and Clas 71, 72. Students may substitute for Clas 3, 4, or 13–14 two additional courses (6 semester hours) consisting of Clas 64 and a course to be selected in consultation with the departmental advisor.

3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses; (b) 18 semester hours selected from Art 101, 102, 103, 112, 155; Hist 105, 107, 108, 109, 110, 111, 209; Phil 111; PSc 105; Rel 143.

Bachelor of Arts with a major in classical archaeology and classics (departmental)—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 12 semester hours in second-group courses in Greek or Latin. (A reading knowledge of French and German is recommended.)

Minor in classical humanities—(a) 6 semester hours selected from Clas 1–2 or 11–12; (b) 9 semester hours selected from Clas 3, 4, 13, 14, 71, 72, 105, 108, 113, 127, 134, 170, 185, 186; (c) 6 semester hours selected from Art 101, 102, 103, 111; Hist 107, 108, 109, 110.

COURSES IN GREEK, HEBREW, LATIN, AND YIDDISH

First Group

1–2 Beginning Latin (3–3) **Ziolkowski**
A year course; credit toward a degree at this University given on completion of Clas 2. Grammatical essentials of the language, appropriate reading selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

3 Intermediate Latin: Prose and Poetry (3) **Norton**
Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1–2 or equivalent. (Fall)

4 Vergil's Aeneid (3) **Norton**
Significant passages of Vergil's famous epic—in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

11–12 Beginning Greek: Classical (3–3) **Fisher**
A year course; credit toward a degree at this University given on completion of Clas 12. Study of the grammar, vocabulary, and structure of Greek. Reading of selected ancient authors. (Academic year)

13–14 Intermediate Greek: Classical (3–3) **Staff**
Review of grammar; extensive reading of prose and poetry: e.g., Homer, Herodotus, or a play. (Academic year)

21–22 Beginning Hebrew (3–3) **Ticktin**
A year course; credit toward a degree at this University given on completion of Clas 22. Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 per semester. (Academic year)

23–24 Intermediate Hebrew (3–3) **Moses**
Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. Laboratory fee, $17.50 per semester. (Academic year)

25–26 Yiddish for Reading and Conversation (3–3) **Ticktin**
Grammatical essentials of the language, appropriate reading selections, conversational exercises for beginners. (Academic year)

Second Group

103 Modern Hebrew Nonfiction (3) **Moses**
Directed readings in humanities and social sciences. Development of

linguistic skills necessary for independent research. May be repeated for credit. (Fall)

104 **Modern Hebrew Fiction** (3) Moses
Study of selected modern Israeli short stories and poems. May be repeated for credit. (Spring)

109–10 **Major Latin Authors** (3–3) Ziolkowski
Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3–4 or permission of instructor. (Academic year)

134 **Medieval Latin** (3) Andrews
Selections from the Vulgate and representative Latin writers through the 11th century. Prerequisite: Clas 3, 4; or permission of instructor. May be taken for graduate credit with approval of instructor. (Spring)

139–40 **Major Greek Authors** (3–3) Staff
Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff
Advanced reading in Greek, Hebrew, or Latin. Admission by permission of instructor. May be taken for graduate credit.

COURSES IN ENGLISH TRANSLATION

First Group

63 **Greek and Latin Origins of Medical Terms** (3) Ziolkowski
Mastery of medical terminology by learning word elements from Greek and Latin and the principles which govern both the formation of medical words and the derivation of their meanings. (Fall)

64 **Greek and Latin Origins of English Words** (3) Fisher
Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc. (Spring)

71 **Greek Literature and Civilization** (3) Fisher
Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Literature and Civilization** (3) Ziolkowski
Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

100 **Modern Hebrew Literary Classics** (3) Ticktin
Prose and poetry of a century of writing from the beginning of the Hebrew literary renaissance to contemporary Israeli literature, including works of Bialik, Agnon, Peretz, Hazaz, Amichai, and Oz.

Second Group

101 **Israeli Society and Culture: Literary Perspectives** (3) Ticktin
A study of literature reflecting such contemporary issues as the conflict between the "builders' generation" and their children; the cultural contacts of Ashkenazim and Sefardim; image of the Arab; impact of the Holocaust; Zionist ideals and current realities. (Fall)

102 **Contemporary Israeli Short Stories and Poetry** (3) Ticktin
An introduction to post-1948 writers, including A. B. Yehoshua, Amos Oz, David Shahar, Aharon Apfelfeld, Dahlia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana-Karmon. (Spring)

105 Special Topics in Classical Literature (3) **Staff**
Focus on a selected topic, such as athletics in classical antiquity or the hero, or on study of a genre, such as satire or oratory. May be repeated for credit.

108 Classical Mythology (3) **Norton**
Mythology of the Greeks and Romans from the creation of the world: tales of the gods, heroes, and great families that have influenced literature, art, and music. (Fall)

113 Greek and Roman Drama (3) **Staff**
Selected masterpieces of Greek and Roman tragedy and comedy. (Spring)

127 Classical Influence on Western Civilization (3) **Ziolkowski**
A survey of Greek and Roman influence on Western civilization relevant to modern America: literature, art, law, science, philosophy, etc.

170 Women in Classical Antiquity (3) **Norton**
In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society. (Spring)

COMPUTER AND INFORMATION SYSTEMS

See **Statistics.**

CRIME IN COMMERCE

See **Forensic Sciences.**

CRIMINAL JUSTICE

See **Forensic Sciences** and **Sociology.**

DANCE

See **Human Kinetics and Leisure Studies.**

DRAMA

See **Speech and Drama.**

EARLY MODERN EUROPEAN STUDIES

Committee on Early Modern European Studies
R.E. Kennedy *(Chairman)*, C.A. Linden, G.E. Mazzeo, J.P. Reesing, Jr., L.F. Robinson, R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed to enhance the student's understanding of the history, philosophy, religion, science, literature, and art of the five centuries (1300-1800) during which the Western World began to take on its modern dimensions. The program is directed by an interdepartmental committee.

Bachelor of Arts with a major in Early Modern European Studies—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. **Requirements for the major:**
   a. The core interdisciplinary course, *Individualism, Reason, and Tradition in Early Modern Europe* (Hist/Engl/Fren/Ger/Phil/Rel 183, and Art 187).
   b. Six semester hours of second-group French, German, or Spanish literature courses taught in the language, from among the following: Fren 120, 121–22, 123–24; Ger 103–4, 111–12, 131–32; Span 121–22, 123–24, 125.
   c. Phil 112; Rel 145; PSc 106.
   d. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following: Art 104–5, 106–7, 108, 113–14, 121–22; Engl 125 26, 127–28, 129, 130, 131–32; Hist 101, 105, 121–22, 123, 141, 148, 151, 153, 154.

EAST ASIAN LANGUAGES AND LITERATURES

Professor C.W. Shih *(Chairman)*
Associate Professor J. Chaves
Assistant Professors G.C.Y. Wang, D.L. Lee
Lecturers M. Wang, D.F. Lee, T. Kimura

Bachelor of Arts with a major in Chinese Language and Literature (departmental) in the School of Public and International Affairs and Columbian College of Arts and Sciences—The requirements are as follows:

1. The general requirements stated under Columbian College of Arts and Sciences and the School of Public and International Affairs. (Sixty semester hours from Columbian College, or the equivalent from another accredited institution, are required.)
2. **Prerequisite courses**—
Chin 5–6 (preferred); or Chin 1–2, 3–4, and 9; or Chin 7–8 and 9.
3. **Required for the major**—
Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Bachelor of Arts with a major in East Asian Studies (China or Japan)—See Columbian College of Arts and Sciences and the School of Public and International Affairs.

A Junior Year Abroad Program is available.

Master of Arts in East Asian Studies with a concentration in Chinese Language and Literature. The requirements are as follows:

1. The general requirements stated under the School of Public and International Affairs.
2. Prerequisite: 24 semester hours of Chinese language.
3. 12 semester hours of Chinese literature, 6 hours of history, and 6 hours of relevant East Asian courses.
4. 6 semester hours of thesis research.

CHINESE

First Group

*1–2 **Beginning Mandarin Chinese, Level I** (3–3) G. Wang
Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester. (Academic year)

*3–4 **Beginning Mandarin Chinese, Level II** (3–3) G. Wang
Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 **Beginning Intensive Mandarin Chinese, Levels I-II** (8–8) Lee
Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 6: Chin 5. Laboratory fee, $17.50 per semester. (Academic year)

*7–8 **Beginning Intensive Mandarin Chinese** (6–6) Lee, Wang
Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 8: Chin 7. Laboratory fee, $17.50 per session. (Summer)

*9 **Beginning Mandarin Chinese, Level II** (4) Lee
Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $17.50. (Fall or spring)

10 **Chinese Calligraphy** (1) M. Wang, D.F. Lee
Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring)

11–12 **Intermediate Intensive Mandarin Chinese** (6–6) G. Wang
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6 or 9. Prerequisite to Chin 12: Chin 11. Laboratory fee, $17.50 per semester. (Academic year)

13–14 **Reading Chinese for Beginners** (4–4) Staff
Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language. (Academic year)

22 **Intermediate Chinese Conversation** (2)
A practical course for improving speaking ability. Prerequisite: 6 credit hours of Chinese or equivalent. May be repeated for credit.

†91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia. (Spring)

93–94 **East Asian Literature—in Translation** (3–3) Staff
Lecture and discussion. Survey of Chinese and Japanese literature, from earliest periods through literary masterpieces of the early 20th century. (Academic year)

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* The combination of Chin 1-2, 3-4, and 9, or the combination of Chin 7-8 and 9, is equivalent to Chin 5-6.

† An interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

Second Group

107–8 **Readings in Modern Chinese** (3–3) **Staff**
Intensive readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

109–10 **Introduction to Classical Chinese** (3–3) **Shih**
Introduction to classical writing in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Alternate academic years)

123–24 **Introduction to Chinese Linguistics** (3–3) Lee
Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Alternate academic years)

161–62 **Chinese Culture Through Films** (3–3) Shih
Survey of the Chinese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English.

163–64 **Chinese Literature in Translation** (3–3) Chaves
An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year)

179–80 **20th-Century Chinese Literature** (3–3) Shih
Works of Lu Xun, Lao She, and others. Drama of Tian Han and Cao Yu. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

181 **Literature in Traditional Chinese Society** (3) Chaves
Introduction to the various roles played by literature in pre-modern China, as well as the reflection of society in traditional literature. In English. May be taken by graduate students for graduate credit with permission of instructor.

182 **Literature in the People's Republic of China** (3) Chaves
Survey of stories, poems, and plays in the PRC, and their role in political and social events. In English. May be taken by graduate students for graduate credit with permission of instructor.

185–86 **Directed Reading** (3–3) **Staff**
Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) **Staff**
Conferences and group discussions. (Academic year)

Third Group

271–72 **Poetry of the Tang and Song Periods** (3–3) Chaves
Reading of works of leading poets. Discussion of content and style. Prerequisite: Chin 109 or equivalent. (Alternate acadamic years)

273 **Yuan Drama** (3) **Shih**
Readings of plays by Guan Han-qing, Ma Zhi-Yuan, and others. Prerequisite: Chin 109 or equivalent.

277–78 **Prose Narratives of the Song, Ming, and Qing Periods** (3–3) Shih
Short stories of the Song period. Selected readings of Ming-Qing novels. Historical development and stylistic traits. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

299–300 **Thesis Research** (3–3)

JAPANESE

First Group

1–2 **Beginning Japanese, Level I** (4–4) Kimura
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Japn 2: Japn 1. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Beginning Japanese, Level II** (4–4) Kimura
Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more emphasis on written language and reading. Prerequisite to Japn 3: Japn 2. Prerequisite to Japn 4: Japn 3. Laboratory fee, $17.50 per semester. (Academic year)

Second Group

111–12 **Japanese Literature in Translation** (3–3) Chaves
An introductory survey of traditional and modern Japanese literature read in English translation: love and nature poetry; theater (classical drama, puppet plays); fiction; diaries. Particular emphasis is placed on the great women writers of Japan. (Academic year)

KOREAN

First Group

1–2 **Beginning Korean, Level I** (4–4) Staff
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Kor 2: Kor 1. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Beginning Korean, Level II** (4–4) Staff
Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more emphasis on written language and reading. Prerequisite to Kor 3: Kor 2. Prerequisite to Kor 4: Kor 3. Laboratory fee, $17.50 per semester. (Academic year)

ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr., J. Aschheim, R.P. Sharkey, H. Solomon, S. Levitan, C.Y. Hsieh, J.L. Gastwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.E. Haber, A. Adams *(Research)*, R.S. Goldfarb *(Chairman)*, J.R. Barth, A.E. Burns *(Emeritus)*, O. Havrylyshyn

Adjunct Professors T.F. Carroll, J. Grunwald, P. Swamy, J. Hardt, E.M. Hadley, V. Tanzi

Professorial Lecturers R.E. French, T. Suranyi-Unger, Jr., R. Hayn, E.H. Solomon

Associate Professors R.Y. Yin, A.M. Yezer, J.J. Cordes, J. Pelzman, B.L. Boulier, J.E. Kwoka, R.P. Trost, I. Kyriakopoulos, M.L. Marlow

Associate Professorial Lecturers S.A. Rhoades, R. Sastry, W.J. Scanlon, J.M. Wolgin, M.I. Blejer, G. Caprio

Assistant Professors M.R. Metzger, V. Fon, H.S. Watson, G.E. Wright, Jr., W.A. Anderson, J.P. Link, M.D. Bradley, E.A. Milor *(Visiting)*

Assistant Professorial Lecturers L.R. Jacobson, E.C. Suss

***Bachelor of Arts with a major in economics (departmental)*—The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Prerequisite course—Econ 1–2.

3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; six semester hours of a social science other than economics.

4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

Minor in economics—a) 18 credit hours in economics, including Econ 1, 2, 101, 102, 121, and one other 100-level course in economics; b) 6 credit hours of an approved statistics sequence, such as Stat 111–12; or 6 hours selected from Math 31, 32, 41–42, 51–52; or 3 hours of an approved statistics course plus 3 hours selected from Math 31, 32, 41–42, 51–52.

Master of Arts in the field of economics—Prerequisite: a Bachelor of Arts degree with a major in economics or an equivalent degree. An understanding of basic calculus is assumed for those entering the Master of Arts program in economics.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Econ 203–4, 205, and 275 or 279; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; (4) completion of a tool requirement (either the passing of a reading knowledge examination in one foreign language or the satisfactory completion of one of the following courses: Math 124, Stat 157, 160, or 197); and (5) either a thesis (Econ 299–300) or 12 semester hours selected from additional third-group economics courses.

Doctor of Philosophy in the field of economics—Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Econ 202, 203–4, 205–6, 215–16, and 27 additional semester hours of approved graduate course work including Econ 275 or 279; (2) passing of the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee; (3) completion of the tool requirement: the passing of a reading knowledge examination in one foreign language, plus the satisfactory completion of Math 124, Stat 197, or Stat 160 (a minimum of six semester hours completion of Math 124, Stat 197, or Stat 160 (a minimum of six semester hours in approved graduate course work, completed with a grade of *B* or above, in a department other than Economics, is permitted as a substitution for the language reading examination); and (4) a dissertation to demonstrate the candidate's ability to do original research in one of the following fields: econometrics development, economic history, economic policy, economic theory, environmental economics, health economics, history of economic thought, industrial organization, international economics, labor economics, mathematical economics, monetary economics, national income accounting, natural resources economics, public finance, regional and urban economics, and Soviet economics.

Departmental prerequisite: Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18.

First Group

1–2 Principles of Economics (3–3) Hsieh, Dunn

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1:

macroeconomics; Econ 2: microeconomics. (Econ 1 and 2—fall and spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Intermediate Microeconomic Theory** (3) Yin, Fon
Analysis of supply, demand, and pricing. (Fall and spring)

102 **Intermediate Macroeconomic Theory** (3) Yin, Bradley
Theories of national income determination and growth. (Fall and spring)

104 **History of Economic Thought** (3) Hsieh
History of the major schools of economic thought, influence of changing problems on the development of economic theory. Prerequisite: Econ 101, 102.

105 **Economic Conditions Analysis and Forecasting** (3) Kendrick
Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth, Marlow
The role of money, credit, interest rates, foreign exchange rates, and commercial banks and other financial institutions in the U.S. economy. (Fall and spring)

122 **Monetary Theory and Policy** (3) Aschheim, Marlow
Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates and price level. Problems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

123 **Introduction to Econometrics** (3) Link, Trost
Joint offering of the Economics and Statistics Departments. Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 112. (Spring)

130 **Comparative Economic Systems** (3) Aschheim
Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Pelzman
Analysis and review of the economic development and performance of the Soviet Union from the pre-revolutionary period to the present. (Fall)

134 **Comparative Communist Economic Systems** (3) Pelzman
Analysis and review of the economic development and performance of the East European economies in the post-World War II period. Soviet-type and alternative planning models. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer
Analysis of market mechanisms for allocating energy and natural resources; cases of market failure in the use of the environment; policies to improve resource allocation using market and regulatory strategies. (Spring)

141 **Women in the Labor Market** (3) Haber
Application of the theory of the household and investment in human

* Interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Fall)

142 Labor Economics (3) **Haber**
Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice; wages, prices, and unemployment; poverty and income maintenance. (Spring)

147 Economic History of Europe (3) Sharkey
Joint offering of the Economics and History Departments. European economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 Health Economics (3) **Scheffler**
Analysis of the determination of prices, output, and productivity in the health services sector of the economy.

151 Economic Development (3) Wright
Economic problems of underdeveloped nations, with emphasis on economic theories of development and empirical measurement of development problems.

153 Poverty in America (3) **Yezer**
Exploration of social and economic causes of poverty in the United States and evaluation of present and proposed anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups. Same as Soc 153.

157 Urban and Regional Economics (3) **Yezer**
Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 Industrial Organization (3) Kwoka
Analysis of the structures and production, pricing, and related practices of industries with emphasis on their significance and on appropriate economic policies. (Spring)

159 Government Regulation of the Economy (3) Kwoka
Economic analysis of the rationale for effectiveness of government regulation in the American economy. (Spring)

160 Social and Economic Indicators (3) **Staff**

161 Public Finance I (3) Cordes, Watson
Theoretical and institutional analysis of government expenditures and intergovernmental fiscal relations. (Fall)

162 Public Finance II (3) Cordes, Watson
Theoretical and institutional analysis of tax policy and debt management. (Spring)

165 Economics of Human Resources (3) Stewart
Economic analysis of education and training, information and research, and other contemporary problems. (Fall)

169 Introduction to the Economy of The People's Republic of China (3) Yin
Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)

170 Introduction to the Economy of Japan (3) **Hadley**
Anelysis of the structure and growth of the Japanese economy. (Spring)

179–80 U.S. Economic History (3–3) Sharkey
Joint offering of the Economics and History Departments. Process of economic growth from Colonial times to the present. Development of various sectors in the economy and their interdependence. Econ 179: 1607-1865. Econ 180: 1865 to present. (Academic year)

181–82 **International Economics** (3–3) Dunn, Pelzman, Anderson
Econ 181: international trade theory and international monetary theory. Econ 182: continuation of international monetary theory; economic development. (Academic year)

185 **Economic History and Problems of Latin America** (3) Staff
Analysis of present structures and problems of Latin American economies. (Spring)

198 **Proseminar in Economics** (3) Aschheim, Suranyi-Unger
Examination of major topics in economic theory and the application of theory and analysis to policy problems. Open only to economics majors in their senior year. (Fall and spring)

199 **Independent Research in Economics** (3) Staff
Under the personal direction of an instructor. Limited to economics majors with demonstrated capacity. Prior approval of instructor required. (Fall and spring)

Third Group

Third-group economics courses (except 217–18 and 220) are designed for graduate students in economics or for other graduate students having had Econ 217–18 or 101 and 102, plus any prerequisites specific to the particular course.

202 **History of Economic Thought** (3) Hsieh
Critical analysis and interpretation of the development of economic theory from Plato through the formulation of the Neoclassical Synthesis paradigm and contemporary revisions of the Neoclassical Synthesis. (Fall and spring)

203–4 **Microeconomic Theory** (3–3) Goldfarb, Metzger, Fon
Econ 203: demand, production, cost theory. Prerequisite: Econ 101 or equivalent. Econ 204: market structure, welfare, general equilibrium. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

205 **Macroeconomic Theory I** (3) Barth, Bradley
Alternative theories of income, employment, and the price level; fiscal and monetary policy impacts; the role of expectations in the economy. (Fall and spring)

206 **Macroeconomic Theory II** (3) Barth, Bradley
Continuation of Econ 205. Extensions of alternative models of income determination; application of analytic frameworks to the U.S. economy; examination of uncertainty and policy strategy. (Fall and spring)

207 **Business Cycle Analysis** (3) Kendrick
Empirical analysis of American business cycles; evaluation of the methodology and findings of the National Bureau of Economic Research. (Fall)

208 **National Income** (3) Kendrick
Theory and measurement of economic aggregates within an integrated national income accounts framework, including balance sheets and wealth statements. (Fall)

209 **Capital and Growth Theory** (3) Hsieh
Growth models under both the paradigm of the Neoclassical Synthesis and that of Post-Keynesian economics. Other selected topics in Post-Keynesian economics and recent attempts to attain a new synthesis in economic theory. Prerequisite: Econ 205.

214 **Survey of Mathematical Economics** (3) Fon
For graduate students in fields other than economics. Differentiation, partial differentiation, and economic optimization problems. Comparative statics. Input-output analysis. Difference, differential equa-

tions, and economic applications. Prerequisite: one semester of calculus and Econ 217–18.

215–16 **Mathematical Economics** (3–3) Fon
Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 **Survey of Economics** (3–3) Holman, Suranyi-Unger
For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

220 **Survey of Principles and Issues in Economics** (3) Holman
Survey of economic theory and its application to contemporary economic problems. Departmental prerequisite waived.

223–24 **Monetary Theory and Policy** (3–3) Aschheim, Barth
Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 **Rural Development Policies** (3) Carroll
Review of poverty-oriented rural development strategies in the LDCs. Theories and experiences of land reform, peasant cooperatives, small-farm technology, rural-urban linkages, and planning a rural service network. (Fall)

234 **Rural Development Projects** (3) Carroll
Design and evaluation of rural-based investment projects, including multi-sectoral approaches to integrated planning of rural regions, with case studies drawn from the experience of international agencies. Prerequisite: Econ 233 or permission of instructor. (Spring)

235 **Energy Resources and Policy** (3) Staff
Consideration of economic and related policy issues directed at energy problems. (Fall)

236 **Middle East Economics** (3) Staff
Survey of Middle East economics emphasizing the application of economic tools to selected issues of importance.

237 **Economics of the Environment and Natural Resources** (3) Holman
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)

239 **Economics of Defense** (3) Solomon
Economic analysis applied to national security planning and objectives. Analysis of defense establishment problems, including manpower, the defense industry base, procurement policy. (Spring)

241–42 **Labor Economics** (3–3) Goldfarb
Theory of wages and employment, analysis of labor supply and demand. Analysis of unemployment; unions; labor market discrimination. Econ 241 is prerequisite to Econ 242. (Academic year)

243 **Seminar: Human Resource Policy** (3) Levitan
The shifting composition of the American work force and its measurements; linking of work and welfare; preparation for work; evaluation of public investment in human resource development. Open to undergraduates. (Fall)

244 **Economics of Education** (3) Staff
Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 **Industrial Organization** (3–3) Kwoka
Structure and performance of the American economy; emphasis on the economics of antitrust policy and the impact of government regulatory policies. (Academic year)

247 Seminar: Industrial Organization (3) Staff
Selected topics in regulatory economics and in antitrust economics during alternate years. Prerequisite: Econ 101 or equivalent. Offered off-campus only. (Spring)

248 Health Economics (3) Staff
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency and allocation of health care services.

251 Economic Development Theories (3) Havrylyshyn
Basic theories of economic growth and development. Emphasis on theories inspired by the development process in Third World countries. (Fall and spring)

252 Economic Development Planning (3) Havrylyshyn
Development planning techniques and practice at both the macro and micro levels. Macro-planning tools analyzed include input/output, multi-sector models, simulation, and linear programming. Micro-planning includes the use of cost-benefit techniques in project analysis. Prerequisite: Econ 251. (Spring)

253 Productivity Analysis (3) Kendrick
Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall)

254 Economics of Advertising and Information (3) Staff
Theory and empirical analyses of the role of advertising and information in industry structure and performance. (Fall)

255 Economics of Technological Change (3) Suranyi-Unger
Economic principles related to determining the proper federal role in influencing civilian-oriented technological change. (Fall)

257 Regional Economics (3) Yezer
Analysis of patterns of urban and regional growth, planning models, interregional production and trade, migration, firm location, and spatial pricing. (Fall)

258 Urban Economics (3) Yezer
Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)

259 Income Distribution (3) Stewart, Carroll
Theoretical and empirical analysis of income distribution, including analysis of policies related to reducing income inequality. (Spring)

261 Welfare Economics (3) Stewart
Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

263 Theory of Public Finance I (3) Cordes, Watson
Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures, and intergovernmental fiscal relations. (Fall)

264 Theory of Public Finance II (3) Cordes, Watson
Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)

265 Seminar: Fiscal Policy in Developing Countries (3) Tanzi
(Formerly Readings in International Taxation)
Examination of topics in the public finances of developing countries including taxation, expenditure, and macroeconomic aspects. (Fall)

267 Seminar: Soviet Economy (3) Hardt, Pelzman
Development of the Soviet-type economy. Organization, policies, and

problems: monetary, production, allocative, foreign trade, economic growth. Admission by permission of instructor. (Fall)

268 **Seminar: Economic Theory and Development in Communist Countries** (3) Hardt, Pelzman
Appraisal of the Soviet model for economic development in the communist world, especially in Eastern Europe and China. Admission by permission of instructor. (Spring)

269 **Economy of The People's Republic of China I** (3) Yin
Analysis of organization, operation, policies, and problems. Development of the economy since 1949. (Fall)

270 **Economy of The People's Republic of China II** (3) Yin
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

271 **Economy of Japan** (3) Hadley
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

275 **Econometrics I: Introduction** (3) Trost, Link
Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Topics include heteroscedasticity, serial correlation, and lagged dependent variables. Prerequisite: Econ 123. Some exposure to matrix algebra is helpful, but not required. (Fall and spring)

276 **Econometrics II: Simultaneous-Equation Models** (3) Trost, Link
Simultaneous-equation models of economic behavior. Optional topics are maximal-likelihood estimation, limited dependent variables, and quantal-response models. Prerequisite: Econ 275. Recommended: a course in matrix algebra. (Spring)

277 **Laboratory in Applied Econometrics** (3) Trost, Link
Application of econometric theory. Use of econometric software. Each student will be required to write an empirical research paper. Prerequisite: Econ 275 or, with the permission of the instructor, Econ 123.

279 **Methods in Economic Statistics** (3) Gastwirth
Joint offering of the Economics and Statistics Departments. Application of statistical methods to economic data. Curve-fitting, regression, analysis of variance, and chi-square and non-parametric techniques are used to analyze economic data. Prerequisite: a one-year course in statistics. (Fall and spring)

281–82 **International Economics** (3–3) Dunn, Pelzman
Econ 281: theory of international trade and factor movements. Econ 282: international finance. (Academic year)

285–86 **Economic Development of Latin America** (3–3) Grunwald
Econ 285: diversity of structures of Latin American economies; relevant theories; import substituting industrialization; inflation; problems of underemployment and income distribution. Econ 286: structure of trade; protection, exports, and economic development; regional and global economic integration; foreign investment, multinational enterprise, and technology transfer. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Geog Hist/Span 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Boulier
Introduction to basic demographic perspectives and data; methods

for analysis of population size, distribution, and composition; determinants and consequences of population trends. Same as Geog/Soc/Stat 290. (Fall)

291 **Methods of Demographic Analysis** (3) Boulier
Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. Same as Geog/Soc/Stat 291. (Spring)

298 **Reading and Research** (3)
Limited to Master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires, and may be repeated for credit with permission of the instructor.

305 **Seminar: Macroeconomics** (3) Barth, Bradley
Selected topics in macroeconomics. Prerequisite: Econ 205.

310 **Economic Methodology** (3) Stewart
(Formerly Econ 210)
Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory.

312 **Seminar: Price Theory** (3) **Staff**
Discussion of topics of price theory from recent journal articles.

313 **Seminar: Economic Thought** (3) **Hsieh**
Continuation of Econ 202. Principal trends in economic thought.

315 **Seminar: Topics in Mathematical Economics** (3) **Solomon**
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16.

321 **Seminar: Monetary Theory** (3) Aschheim, Barth
Recent developments in monetary theory.

341 **Seminar: Labor Economics** (3) **Staff**
Current problems in theory and policy.

345 **Seminar: Industrial Organization** (3) Staff
Review of recent literature and current policy issues. Admission by permission of instructor.

348 **Topics in Health Economics** (3) Staff
An in-depth treatment of advanced topics in health economics. Prerequisite: Econ 248 or permission of instructor.

351 **Seminar: Economic Development** (3) Staff
Analysis and review of recent theoretical work in the field, and/or selected topics of current policy interest. Prerequisite: Econ 251 and 252 or permission of instructor.

363 **Seminar: Public Finance** (3) Cordes, Tanzi
Selected topics of current interest.

367 **Seminar: Soviet Planning in Theory and Practice** (3) Pelzman
A coherent analysis of planning in the Soviet Union in theory and in practice. Marxist ideology with modification is taken as the primary force shaping the objective function of Soviet planners. Prerequisite: knowledge of basic calculus.

378 **Seminar: Topics in Econometrics** (3) Swamy
Research seminar covering current econometric literature and special topics. Admission by permission of instructor. Same as Stat 378.

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the Economics and History Departments. Econ 379: American economic history. Econ 380: modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) Staff
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) Staff
Topics selected from current significant policy problems.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

EDUCATION

Professors R.E. Baker, M.N. Rashid, L.H. Elliott, L. Nadler, J.G. Boswell *(Chairman)*, C.E. Vontress, S. Kavruck, D.A. Moore, L. Winkler, D. Linkowski, F.J. Brown, E.P. Kulawiec, E.W. Kelly, Jr., S.R. Paratore, R. Ferrante, G.L. Horrworth, E.J. Gleazer, Jr. *(Visiting)*, M. Burns, J.C. Heddesheimer, G.W. Smith, C.S. Tidball, J.A. Greenberg, R.I. Peterson
Adjunct Professor R.C. Rist
Professorial Lecturers D. Iwamoto, A.C. Jensen, D.D. Darland
Associate Professors G.D. Wiggs, J.D. Fife, D.H. Holmes, R.A. Luke, E.R. Lilly
Associate Professorial Lecturer S.S. Beck
Assistant Professors P. Finnerty-Fried, C.H. Hoare
Assistant Professorial Lecturers M.R. Phelps, P. Callas, E. Zuniga, S.J. Knight
Instructor C.B. Stapp
Lecturer L. Martin

See the School of Education and Human Development for programs of study leading to the degrees of *Bachelor of Arts in Education and Human Development*, *Master of Arts in Education and Human Development*, *Master of Arts in Teaching*, *Education Specialist*, and *Doctor of Education*.

First Group

50 **Introduction to Education and Human Services** (3) Boswell and Staff
(Formerly Educ 101)
The scope of education and human services is defined from historical, philosophical, and cross-cultural perspectives. Field trips and guest speakers. Field work is required. (Fall and spring)

71 **Introduction to Human Development I** (3) Staff
(Formerly Educ 102)
Lectures and field work. All aspects of development through adolescence; child study techniques. Two to three hours weekly field experience in appropriate setting. (Fall and spring)

72 **Introduction to Human Development II** (3) Staff
(Formerly Educ 103)
Lectures and field work experiences. Development from young adulthood on. (Fall and spring)

Second Group

Educ 136, 137, 138, 139, 140, 144, and 146 are special methods courses which are to be elected in the senior year by students in the secondary school curriculum after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104, 105 for elementary majors; Educ 131 for secondary majors.

100 **Special Workshop in Education and Human Development** (arr.) — Staff

Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

104 **Psychology for Learning and Teaching** (3) — Staff

Principles, theory, nature, and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. (Fall and spring)

105 **Social Issues in Education and Human Services** (3) — Boswell and Staff

Historical and social development of education and human services, contemporary issues, interrelationship of educational and human service institutions, policy considerations and future issues. Field work is required. Prerequisite: Educ 50 or permission of instructor. (Fall and spring)

110 **Elementary School Teaching of Reading** (3) — Horrworth

Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and 105 or teaching experience.

111 **Elementary School Curriculum and Methods** (3 to 18) — Moore and Staff

A comprehensive block course that includes diagnostic reading, mainstreaming, mathematics, science, language arts, social studies, music, art, physical education. Pre-student teaching one and one-half days a week. Prerequisite: Educ 71, 72, 104, 105; and senior standing. (Fall)

112 **Measurement and Evaluation** (3) — Staff

Basic evaluative measurement techniques: selection, administration and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis. (Fall and spring)

113 **Elementary School Art** (3) — Staff

Lecture and laboratory (3 hours), field work—as arranged. For undergraduates in the elementary school curriculum. Materials and methods. Material fee, $5. (Spring)

118 **Elementary Reading: Classroom Diagnosis and Instruction** (3) — Horrworth

Emphasis on diagnostic procedure aimed at individualizing and improving classroom instruction. Prerequisite: Educ 110 or equivalent. (Fall and spring)

120 **Experimental Course in Education and Human Development** (arr.) — Staff

Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

121 **International Experiences** (1 to 6) — Staff

Travel to a foreign country for study of a specific topic.

124 **Communications Skills** (3) — Staff

Theory and practice in the development of professional relationships

and communication: teacher–student, museum–school, group strategies. The interview; independent proposal writing.

125 **Museums as Cultural and Educational Resources** (3) Staff
Use of the museum for knowledge and enjoyment; museum objects as primary sources; meetings in D.C.-area art, history, and science museums.

128 **Children's Literature** (3) Staff
Lectures, discussion, and field work. Classics as well as newer books for children and youth are explored. Significant authors and illustrators are highlighted. (Spring)

129 **Critical Social Issues in Literature for Children and Youth** (3) Staff
Content evaluation of books, including issues such as ethnicity, sexism, family problems, handicapping conditions, death, and the role of fantasy versus realism. (Summer)

131 **Secondary School Principles and Methods** (3) Kulawiec
For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group-work to be arranged. Prerequisite: Educ 104 and 105. (Fall)

132 **Student Teaching in Early Childhood Schools** (3 or 6) Staff
For seniors. Supervised teaching in selected prekindergarten or kindergarten class in accredited school; seminar. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent; Educ 150, 152, 153, 154. (Fall and spring)

133 **Supervised Experience in Education and Human Development Services** (3 to 6) Staff
Field work, internship, and instructional practice: (1) adult education and human resource development (Wiggs); (2) college student development experience (Burns); (3) higher education (Greenberg); (4) museum education (Nashman); 5) counseling (Heddesheimer). Admission by permission of instructor. (Fall and spring)

134 **Student Teaching in Secondary Schools** (6 to 9) Kulawiec and Staff
For seniors. Admission by permission of instructor. Prerequisite: Educ 131. (Fall and spring)

135 **Student Teaching in Elementary Schools** (6 or 12) Moore and Staff
Supervised teaching in the elementary school for one semester. Seminar for seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent. (Fall and spring)

136 **Teaching English in Secondary Schools** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in English. (Spring)

137 **Teaching Speech** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in speech or permission of instructor. (Spring)

138 **Teaching Social Studies in Secondary Schools** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 **Teaching Art in Secondary Schools** (3) Staff
Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of Art. Material fee, $5. (Spring)

140 **Teaching Mathematics in Secondary Schools** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: mathematics through calculus. (Spring)

144 **Teaching Science in Secondary Schools** (3) Kulawiec
Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 **Teaching Foreign Languages** (3) Kulawiec
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 **Foundations of Early Childhood Education** (3) Staff
Historical development, philosophy, and objectives of nursery schools, kindergartens, and day care; exploration of contemporary programs and models with curriculum implications for schools in the U.S. and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) Staff
Rationale, development, content approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) Staff
Planning, reporting, records, teacher-child and teacher-family interaction, diagnosis and evaluation, working with paraprofessionals and parents. Emphasis on total classroom ecology. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) Staff
Interaction with community agencies and resources for services; equipment, play activities, curriculum materials, and methods for teaching the infant and young child. Admission by permission of instructor. (Spring)

161 **Human Development** (3) Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

171–72 **International Education** (3–3) Moore
Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized. (Summer)

173 **Comparative Education** (3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

175 **Interpretation in the Historic House Museum** (3) Stapp
Seminar integrating advanced practices of museum education with current scholarship in architectural history, material culture, social history, and women's studies. Extensive use of Washington museum resources. (Fall)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler
Same as HKLS 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference, and related conference activities. (Fall and summer)

180 **Computer Literacy** (3) Tidball, Burns
Classroom presentations (changing computer utilization, computer terms and practices, academic administrative computer applications) and sessions in the microcomputer laboratory, including hands-on experience with computer-assisted instruction, introduction to BASIC, and a supervised individual project. No previous computer experience required. May be taken for graduate credit. Material fee, $30. (Fall and spring)

187–88 **Sign Language and Deafness** (3–3) Martin and Staff
Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as HKLS/SpEd 187–88.

193–94 **Research and Independent Study** (arr.) Staff
Individual research under guidance of a staff member. (Academic year)

Third Group

Departmental prerequisite: A degree from an accredited institution is prerequisite to all third-group courses in education. Adequate professional preparation is prerequisite to all third-group courses in education except for those courses limited to students in the M.A.T. degree program. Undergraduate students in their senior year may enroll in third-group courses with permission from the instructor.

200 **Special Workshop in Education and Human Development** (arr.)
Topics to be announced in *Schedule of Classes*. May be repeated for credit.

201–2 **International Education** (3–3) Moore
A study of a selected sample of foreign education systems as they reflect culture, values, people, and current changes in the world today. Research techniques and materials to develop a global frame of reference. Foreign resources utilized. (Summer)

203–4 **Comparative Education** (3–3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Academic year)

205 **Foundations of Curriculum Development** (3) Staff
For experienced teachers. Curriculum research and design, issues and trends, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of current field-related problems. (Fall and spring)

207 **Instructional Materials, Media, and Resources** (3 to 6) Staff
Review of technological contributions to education. Examination of current and emerging developments. Framework for study of selection, utilization, integration, and evaluation of audio-visual media in the teaching/learning process.

208 **Human Development** (3) Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

209 **Child Development** (3) Rashid
Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development** (3) Rashid
Interdisciplinary approach to adolescent development and behavior.

Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Kavruck, Smith, and Staff
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **Western Educational Thought** (3–3) Boswell, Darland
Following the themes of certainty, equality, and progress, this course examines the ideas of selected philosophers in their historical context, and relates them to education. Educ 213: From Sumer to the Enlightenment; Educ 214: From the Enlightenment to the present with concentration on the American experience. (Fall and spring)

215 **Practicum for the Gifted** (3 or 6) Rashid
A culminating supervised experience in a variety of settings for students in the M.A. program for the gifted. Admission by permission of the instructor.

216 **Advanced Study of the History of Education** (3) Boswell, Darland
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

217 **Advanced Study of the Philosophy of Education** (3) Boswell, Darland
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

218 **Social Foundations of Education** (3) Kulawiec
The relationship between school and society explored: social, economic, and political purposes of schooling as well as forces that shape policies and school curricula. Contemporary issues studied with implications for the future.

219 **Theory and Practice of Classroom Teaching** (3) Baker
Current theories of teaching and learning and their application to strategies of classroom teachers. (Summer)

220 **Experimental Course in Education and Human Development** (arr.) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

221 **International Experiences** (1 to 6) Staff
Travel to a foreign country for specific study and research. Admission by permission of the instructor.

222 **Foundations of Reading Development: K–Adult** (3) Horrworth
Basic theories and processes of reading acquisition; linguistic, cognitive, developmental, social, and affective bases of reading; varieties and influences of media and instructional modalities.

223 **Reading Instruction in Content Areas—Elementary, Intermediate, and Secondary Schools** (3) Horrworth
Emphasis on basic group instructional methods and media; teaching demonstrations of basic reading and study skills in content subjects; study of readability of content materials; research and application of formulas. (Fall)

224 **Diagnostic Teaching of Reading—(K-12)** (3) Horrworth
Classroom diagnostic techniques for elementary and secondary teachers; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests as well as other measures of evaluation; study of materials; selecting and planning

activities suitable for correction of specific problems. Prerequisite: at least one previous course in reading. (Spring)

226 **Diagnostic Teaching of Reading in Secondary School** (3) Horrworth
Application of instructional strategies and techniques in Educ 223 and 224: construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study and evaluation of materials and teaching procedures; application of readability formulas; class demonstrations of teaching strategies. Admission by permission of instructor. (Spring)

227 **Basic Issues in Elementary Education** (3) Baker
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Baker
Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education. (Spring)

234 **Organization for Personalized Learning in the Open Classroom** (3) Horrworth
Practical application of individualized instruction theories and methods through design, development, implementation, and revision of elementary and secondary level self-instructional packages.

235 **Analysis of Teaching** (3) Boswell, Ferrante
Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program. (Fall)

236 **Technical Programs in Human Resource Development** (3) Wiggs
Analysis of the nature and scope of human resource development technical training in industry, government organizations, and labor unions. (Spring)

237 **Designing Technical Training Programs** (3) Wiggs
Applications of behaviorist design models for curriculum and methodological strategies in technical skills training programs. (Summer)

239 **International Programs in Adult Learning** (3) Staff
The use of adult learning programs (adult education, human resource development, higher education, etc.), in various parts of the world, as provided by international agencies, multi-national companies, and public foundations. Emphasis on national development, social problems, economic growth.

240 **Proposal Writing** (3) Ferrante
The preparation of proposals for educational, business, and industrial applications, including those submitted for funding. Many styles and formats are illustrated. Each student will prepare a proposal in cooperation with an organization or agency. (Fall and summer)

241 **Education of the Gifted and Talented** (3) Rashid
Nature and discovery of giftedness, provision for the gifted in educational settings. Research findings and issues.

242 **Fundamentals of Educational Administration** (3) Brown
Organization, structure, and governance of public education; federal, state, and local responsibilities. Basic administrative leadership theory. Roles and functions of school administrators.

246 **Administrative Issues in Urban Education** (3) Lilly
Administrative strategies and practices appropriate to problems of urban schools.

247 **Post-Secondary Career Education** (3) Greenberg
Development, current concepts, agencies involved, problems, and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college. (Spring)

248 **Supervision of Instruction** (3) Lilly
Study of interdisciplinary foundations of supervision. Special attention to the function of theory, change, individual and group relationships in organizations, staff influence processes, talent utilization, and evaluation of programs and staff. (Fall)

249 **Drug Treatment and Resources** (3) Staff
Individual, social, and cultural factors related to drug abuse and its treatment.

250 **Counseling Drug Abusers** (3) Staff
Crisis intervention, self-help groups, family therapy; individual and group counseling applied to drug abusers.

251 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

252 **Organization and Administration of Counseling Services** (3) Vontress
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

253 **Individual Appraisal in Counseling** (3) Winkler
Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent. (Fall and spring)

254 **The Middle School** (3) Kulawiec
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

255–56 **Secondary Education** (3–3) Kulawiec
Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices. (Alternate academic years)

257 **Career Development and Information** (3) Vontress
Theories of career development; factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information. (Fall and spring)

258 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress
Theories and practices of counseling. Prerequisite: 12 semester hours in counseling, including Educ 253 and 257. (Fall and spring)

259 **The Principalship, K-12** (3) Lilly
A general introduction to the principalship. Administrative tasks and procedures are stressed, together with the principal's role in handling educational issues and problems. Prerequisite: Educ 242.

260 **Supervision in the Elementary and Secondary School** (3) Staff
For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. (Spring)

261 **Practicum in Counseling and Human Development** (3) Rashid and Staff
Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258 for counseling majors; permission of instructor for human development majors. (Fall and spring)

262 **Internship in Counseling and Human Development** (3) Heddesheimer, Rashid
Separate sections offered for counseling majors and human development majors. Admission by permission of instructor. (Spring)

263 **Human Resource Development: Training and Education** (3) Nadler, Luke, Wiggs
Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall)

264 **Design of Training Programs in Human Resource Development** (3) Nadler, Luke
Training, education, and development programs for various client systems will be planned using critical-events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor. (Spring)

265 **Futurism and Education** (3) **Kulawiec**
Contemporary view of the future through readings, discussion, simulation, games, and films. Impact of technology on humans and the environment. An examination of selected individuals and their ideas related to future studies.

267 **Human Sexuality for Counselors** (3) Winkler
The purpose of this course is to increase the awareness and understanding of sexuality as it relates to counseling in contemporary society.

268 **Family Counseling** (3) **Winkler**
The family as a system: how it affects the client and how the client affects it. Didactic presentations, role-playing, and work with simulated families. (Spring)

269–70 **School Business Management** (3–3) Brown
Educ 269: Philosophy, responsibilities, and functions of school business management. Educ 270: Practicum in school business management. Educ 269 is prerequisite to Educ 270. (Academic year)

271 **Policy Making for Public Education** (3) Boswell, Ferrante
The nature of educational policy: the role of single-interest groups, the courts, legislative bodies, administrative bureaucracies, and professionals in establishing parameters and allocating resources. Analysis of specific techniques of policy formation. (Summer)

272 **Educational Planning** (3) **Zuniga**
An examination of the planning movement in education: its historical development and the recent shift in premises, context, and expectations. Different approaches to the planning process: its relationship to the concepts of systems and futurism; participatory, sectorial, and regional aspects; role of research, and overview of main analytical techniques currently in use. (Fall)

273 **Pre-Service Teacher Education** (3) Staff
Program development, governance, issues, trends. (Fall, alternate years)

274 **In-Service Teacher Education** (3) Staff
Continuing professional development of educators, costs and benefits to society, promising programs and practices, current issues. (Spring, alternate years)

275 **School Finance** (3) **Brown**
Issues in financial support of public education. Local, state, and federal roles. Budget development and administration.

276 **Public Relations in School Administration** (3) Brown
The function, purposes, and resources of school public relations. Development of skills in planning public relations programs and activities. Theory and practice of effective communication.

277 **Dynamics of Change** (3) Boswell
An analysis of the process of cultural change in Western society, with emphasis on education. Comparison of theories; analytical tools; historical precedents; the contemporary situation, prospects for the future.

278 **School Law** (3) Lilly
Constitutional and statutory provisions for public school education; origin and legal status of the local school unit; nature of the school board; legal status of teachers and administrators; legal rights and responsibilities of parents and pupils. (Spring)

279 **Adult Education** (3) Wiggs
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning** (3) Wiggs, Luke
Determining educational needs for adults in school and non-school agencies; designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

281 **Program Evaluation: Theory and Practice** (3) Holmes
A general introduction to the theory of evaluation of social programs. Overview of evaluation models, methodology associated with program evaluation, and examination of evaluation in the context of political and social environments. (Fall and spring)

282 **Introduction to Qualitative Research Methods** (3) Rist
A general introduction to qualitative research procedures in social science research. Application of qualitative methods, design, analysis. (Fall and spring)

283 **Higher Education in the United States** (3) Burns
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Staff
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)

287–88 **Clinical Study of Reading Problems** (3–3) Peterson
For advanced students. Diagnostic and corrective work under supervision. Complete case study approach; selection and evaluation of diagnostic and instructional materials and techniques for permanent file. Prerequisite: Educ 222 and 223, or 224 and 226. Material fee $10 per semester. (Academic year)

289 **Organization and Administration of Reading Programs** (3) Peterson
For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program. (Fall)

290 **Severe Learning Disabilities in Reading** (3) Peterson
For experienced teachers. Case studies of children and/or adults with severe reading problems, planning and implementing instructional programs. Admission by permission of instructor. Material fee, $10. (Spring)

291 **Educational Facilities Planning** (3) Brown
Principles of school plant planning; site selection; evaluation of

existing buildings; adaptation to curricular needs; building operation and maintenance; disposition of surplus facilities; energy and accessibility considerations. (Fall)

292 **Practicum in Program Evaluation** (3 to 6) Holmes
Supervised practical experience in field placements. Admission by permission of instructor. (Fall and spring)

293–94 **Research and Independent Study** (3–3) **Staff**
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith, Holmes
Required of all candidates for masters' degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)

297 **Personnel Administration** (3) Brown
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions; current issues. (Spring)

299–300 **Thesis Research** (3–3) **Staff**
Required of M.A. in Ed. degree candidates writing master's theses. (Fall and spring)

302 **Quantitative Methods III: Inferential Techniques** (3) Holmes, Paratore, Smith
Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 **Data Analysis** (3) Staff
Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)

304 **Practicum in Supervision** (3 to 6) Lilly
Practical experience in supervision of instruction. Admission by permission of instructor.

305 **Internship: Supervision** (3 to 6) Lilly
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice.

306 **Quantitative Methods IV: Advanced Research Design** (3) Holmes, Paratore, Smith
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

310 **Museum Studies** (3) Stapp
Study of the museum's functions and its educational roles. Admission by permission of instructor.

311 **Museum Audiences** (3) Staff
Study of the many audiences of many ages who use and enjoy museums; appropriate museum and outreach practices, independent proposal writing.

312 **Internship and Seminar in Museum Education** (6) Stapp
Four-day-a-week placement in education departments in area museums. Supervision and seminar are provided by George Washington University faculty. Admission by permission of instructor.

316 **Recent Developments in Elementary School Social Studies** (3) Moore
For experienced educational personnel. Research, techniques, mate-

rials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Recent Developments in Elementary School Science** (3) Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Recent Developments in Elementary School Mathematics** (3) Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor. (Spring)

321 **Practicum in Curriculum** (3 to 6) Staff
Supervised field experience in curriculum. Admission by permission of instructor. (Fall and spring)

322 **Internship: Reading** (3 to 6) Peterson
Limited to doctoral students in education. Experience in a selected area of college teaching. (Fall and spring)

323 **Internship: Reading** (3 to 6) Peterson
Limited to doctoral students in education. Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) Peterson
Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor. (Spring)

325 **Curriculum Theory** (3) Staff
Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation. (Spring)

328 **Selected Topics in International Education** (3) Moore
Investigation of historical development of international education; selected topics of general importance to the field of international education. Admission by permission of instructor. (Fall)

329 **Seminar in Program Evaluation** (3) Holmes
Contemporary problems and issues in evaluation of social programs: design, implementation, analysis, and utilization. (Spring)

330 **Foundations of Early Childhood Education** (3) Staff
Historical developments, philosophy and objectives of nursery schools, kindergartens and day care centers, exploration of contemporary programs and models with curriculum implications for schools in the United States and abroad. (Fall)

332 **Early Childhood Curriculum** (3) Staff
Rationale, development, content, approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. (Fall)

333 **Role of the Professional in Early Childhood Education** (3) Staff
Planning, reporting, maintaining records, teacher-child and teacher-family interaction, diagnosis and evaluations, working with paraprofessionals and parents. Emphasis on total classroom ecology. (Spring)

334 **Community Resources and Materials for the Young Child** (3) Staff
Interaction with community agencies for services, resources, and

equipment; physical facilities, play activities, curriculum materials, and methods for teaching the infant and young child. (Spring)

335 **Practicum in Early Childhood Education** (3 to 6) Staff
Supervised professional activity in selected early childhood programs; seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

336 **Clinical Practicum in Reading** (3 to 6) Horrworth
Supervised clinical experience in testing and teaching. Approximately 120 clinic hours required. Admission by permission of instructor. (Fall and spring)

341 **Cognitive Models and Instruction** (3) Rashid
Cognitive models (Guilford, Bruner, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid
Nature of language acquisition and development; emphasis on sociolinguistics and psycholinguistics most pertinent to education. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid
Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation and research needs in respect to each topic discussed. Admission by permission of the instructor. (Spring)

344 **Adult Development and Aging** (3) Rashid
Theories and research on personality and cognition in adulthood and old age. Emphasis on evaluating research designs and methods, and deriving implications of findings for gerontological programs and selected professional roles.

352 **Counseling Interview Skills** (3) Heddesheimer
Acquisition of generic counseling skills through lectures, demonstrations by faculty, role playing, and videotaping. Prerequisite: Educ 251 or permission of instructor. (Fall)

353 **Counseling Older Persons** (3) Finnerty-Fried
Special considerations and counseling emphases in regard to second careers, retirement adjustments, death and dying. (Summer)

354 **Cross-Cultural Counseling** (3) Vontress
Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States. (Spring and summer)

355 **Counseling in Groups** (3) Heddesheimer, Winkler
Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. (Fall and spring)

356 **Counseling and the Disciplines** (3) Staff
For advanced students in counseling. Explores the psychological, sociological, economic, anthropological, and philosophical foundations of counseling. Admission by permission of instructor.

357 **Personal and Social Adjustment** (3) Winkler
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

358 **Advanced Theories of Counseling** (3) Vontress
Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

360 **Job Development and Placement** (3) Finnerty-Fried
Job development and modification, and placement of disabled persons. (Spring)

361 **Medical Aspects of Rehabilitation** (3) Finnerty-Fried
Chronic and traumatic disorders with rehabilitation implications. (Fall)

362 **Client Evaluation in Rehabilitation** (3) Staff
Vocational planning through work-sample assessment, testing, interview, and observation. Prerequisite: Educ 212 or equivalent. (Spring)

363 **Psychosocial Aspects of Rehabilitation** (3) Linkowski
Impact of disabilities and concept of normalization. (Fall)

364 **Administration and Governance of Two-Year Colleges** (3) Greenberg
A study of the community junior college, focusing on administrative patterns and national, regional, state, and local influences, as well as the theory and structure of two-year college organization. (Fall and spring)

365 **Foundations of Rehabilitation** (3) Finnerty-Fried
Survey of history, philosophy, legislation, roles and services. Visits to selected field sites. (Fall)

366 **Field Work in Rehabilitation Counseling** (3) Staff
Field work of two full days a week; concurrent seminar. (Spring)

367–68 **Internship: Rehabilitation Counseling** (3–3) Linkowski, Finnerty-Fried
Supervised practice of three full days a week; concurrent seminar. Prerequisite: Educ 366. (Academic year)

369 **Professional Issues in Rehabilitation** (3) Linkowski, Finnerty-Fried
Seminar covering professional problems and ethical issues. Prerequisite: Educ 367. (Spring)

370 **College Students and Their Community** (3) Burns
Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with their environment. Admission by permission of instructor. (Fall)

372 **Internship in Adult Learning** (3 to 6) Greenberg
Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor. (Spring)

373 **The Community-Junior College** (3) Gleazer, Greenberg
The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall and spring)

374 **Current Issues in Higher Education** (3) Ferrante
Prerequisite: Educ 283, 284. (Spring)

375 **Foundations of College Student Development** (3) Burns
College student development as an integral part of higher education programs. (Fall)

376 **Group Theories and Techniques** (3) Burns
Focus on theorists including Argyris, Blaw, Miles, Festinger, and Lewin, and practical application of theories to various organizational settings and individuals. Prerequisite: permission of instructor. (Spring)

377 **Practicum in College Student Development** (3 to 6) Burns
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)

378 **Practicum in Teacher Education** (3 to 6) Boswell
For selected experienced teachers. Supervised field work relevant to students' professional needs, to be arranged. (Fall and spring)

379 **Practicum in Adult Learning Programs** (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring)

381 **Adult Learning** (3) Luke, Wiggs
Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical and social environment in adult education situations. (Fall and spring)

382 **Instructional Strategies in Adult Learning Programs** (3) Luke, Greenberg
Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)

383 **Interviewing/Counseling for Human Resource Developers** (3) Wiggs
Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings. (Fall)

384 **Evaluation of Adult Learning Programs** (3) Wiggs, Luke
Evaluation design strategies for adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)

385 **Collective Negotiations in Higher Education** (3) Fife
Theory, practice, problems, and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3) Staff
For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor. (Spring)

387 **Administration of Adult Learning Programs** (3) Staff
Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations. (Fall)

388 **Case Studies in Higher Education Administration** (3) Ferrante
An analysis of case studies related to administrative functions in colleges and universities. Admission by permission of instructor.

389 **Consultant–Client Relationships in Human Resource Development** (3) Luke
Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280; or approval of instructor. (Fall and spring)

390 **Legal Problems in Higher Education** (3) Fife
Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs. (Spring)

391 **College and University Curriculum** (3) Greenberg, Fife
Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum. (Fall)

392 **Financing Higher Education** (3) Staff
Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices. (Spring)

393 **Practicum in Higher Education** (3 to 6) Greenberg, Burns
Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor. (Fall and spring)

394 **College and University Governance** (3) Staff
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall)

395 **Problems and Practices in Educational Administrative Organization** (3 to 6) Staff
Application of principles and practices concerned with change and evaluation of educational administration.

396 **Internship: Higher Education Administration** (3 to 6) Greenberg
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

397 **Internship: Administration** (3 to 6) Brown, Lilly
Service in an educational institution or education-related program directed by the University's faculty. (Fall and spring)

399 **Seminar: Applied Educational Administration** (3 to 6) Brown, Lilly
Application of the theories and principles of administration to public and private schools. Field experience in a phase of administration and supervision.

Fourth Group

A master's degree from an accredited institution is prerequisite to all fourth-group courses. All fourth-group seminars are open to doctoral candidates or other post-master's degree students with approval of instructor. Study is individually planned on the basis of previous study and experience in the subject field to attain an advanced level of competence and to meet identified professional needs or field requirements.

Each of the following courses is offered fall and spring. Each course may be repeated for credit.

401 **Seminar: Western Educational Thought** (arr.) Boswell, Darland
405 **Seminar: Human Growth and Development** (arr.) Rashid
411 **Seminar: Elementary Education** (arr.) Baker
413 **Seminar: Secondary Education** (arr.) Kulawiec
421 **Seminar: Adult Education** (arr.) Wiggs
422 **Seminar: Higher Education Administration** (arr.) Greenberg, Gleazer
423 **Seminar: Higher Education** (arr.) Greenberg, Gleazer, Burns, Fife
424 **Seminar: College Student Development** (arr.) Burns
425 **Seminar: Teacher Education** (arr.) Boswell, Baker
427 **Seminar: Human Resource Development** (arr.) Wiggs, Luke
A synthesis experience for advanced graduate students in the field of human resource development.

431 **Seminar: Administration, Curriculum, and Supervision** (arr.) Lilly, Brown
Examination of selected major issues confronting school administrators, curriculum specialists, and supervisors.

443 **Seminar: Counseling** (arr.) Staff
445 **Seminar: Research and Evaluation** (arr.) Holmes, Paratore, Smith
446 **Seminar: Reading** (arr.) Peterson

490 **Pre-dissertation Seminar** (3 to 6) **Staff**
Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. Admission by permission of instructor.

491 **Dissertation Research** (arr.) **Staff**
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 490.

EDUCATION POLICY—DOCTORAL PROGRAM

Committee on Education Policy
A.V. Adams *(Chairman)*, J.R. Henig, A.D. Kirsch, C.J. Lange, M.N. Rashid, C.T. Stewart, Jr., J.L. Tropea

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and Human Development and from the Departments of Economics, Political Science, Psychology, Sociology, and Statistics.

This program is concerned with policy research and analysis as it relates to education, broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions. The program is open only to current students. For entering students, education policy is a field in the doctoral program in public policy.

201–2 **Seminar: Current Issues in Education Policy** (3–3) Adams
Review of interdisciplinary literature relating to current education policy issues with emphasis on use of research and analysis in formulating and evaluating policy.

222 **Seminar: Topics in Education Policy** (3) Adams
Intensive interdisciplinary study of special topics in education policy.

290 **Advanced Studies in Education Policy** (3) Adams
Supervised interdisciplinary study and field work in a selected policy area.

399 **Dissertation Research** (arr.) **Staff**

EMPLOYMENT POLICY—GRADUATE PROGRAM

Academic Director R.S. Goldfarb

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Science in the field of employment policy.

Employment policy and human resources management are inseparable parts of business, public policy, and personnel management in both the public and private sectors. This graduate program provides policy analysts and management specialists an opportunity to replace traditional theories and outdated personnel management techniques with new conceptual developments and other innovations.

Specialists and generalists must master the revelant academic disciplines in order to understand and deal with the complex problems involved in the development and utilization of human resources. The program is designed to provide the substantive and theoretical knowledge needed for effective professional performance. Students are given a broad base in economic policy, social and behavioral theory, management theory and practice, and public policy analysis.

Master of Science in the field of employment policy.—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is BAd 218; Econ 217, 241, 243, 259; Educ 257, 263; Mgt 201; PAd 261; Soc 240, 254; and Stat 211.

Each student must pass a Master's Comprehensive Examination.

ENERGY POLICY—GRADUATE PROGRAM

Academic Committee: M.A. Holman, A. Cambel

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the Master of Arts in the field of energy policy.

This master's degree program has been designed to maintain a careful balance of subject matter. Economics courses provide the basis for assembling data and analyzing the benefits and costs of our national energy strategies. Students will examine technical and scientific aspects of energy exploration, research, and development to understand the opportunities and the limits of our technologies. Faculty specialists in political science will introduce an appreciation of the conflict and interplay of forces faced in policy development and implementation. Finally, the environmental dimensions of meeting national needs are considered and brought into proper focus.

Master of Arts in the field of energy policy—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Econ 214, 217, 235, 237, 247; EngS 206 *(Technology and Human Needs)*, 208 *(Energy Conservation)*; ME 257, 258 *(Energy Technology I and II)*; PSc 203, 217, 222.

Each student must pass a Master's Comprehensive Examination.

ENGLISH

Professors C.D. Linton, P.H. Highfill, Jr., J.G. Allee, Jr., J.P. Reesing, Jr. *(Chairman)*, R.N. Ganz, Jr., J.H. Maddox

Adjunct Professor J.C. Broderick

Associate Professors A.E. Claeyssens, Jr., R.C. Rutledge, J.A. Quitslund, J.A.A. Plotz, C.W. Sten, G.R. Bozzini, R.L. Combs, G. Paster, D. McAleavey

Assistant Professors G. Carter, O.A. Seavey, A. Romines, M.V. Dow

Adjunct Assistant Professors F.C. Reid, S.M. Wright

Adjunct Instructors M.C. Edmondson, E. Echeverria, M. Kirkland, C. Meloni, S. Thompson, J.K. Donaldson, Jr., P.A.M. Johnson, A.J.B. Covarrubias, S.M. Spolarich

Jenny McKean Moore Visiting Lecturer in Creative Writing L. Clifton

Bachelor of Arts with a major in American literature or English literature (field-of-study or departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—Engl 51–52 or 61–62 or 71–72 or 191–92.

3. Required courses in related areas—(a) as appropriate, 3–12 semester hours, or waiver of level 4, of a foreign language (classical Hebrew, Greek, Latin, French, German, Italian, Russian, or Spanish); (b) six semester hours of philosophy and/or religion; (c) six semester hours of history (English, American, European, or world).

4. Required for the major:

(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199–200, and in English Literature, Engl 195–96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—30 semester hours of second-group courses offering experience with several approaches to literature which, together, make a discipline of literary study, distributed as follows:

American literature majors—Engl 120, 160, and either 161–62 or 163 and 167; three semester hours of English literature; and 15 additional hours of courses offered by the English Department, of which at least 12 hours must be in American literature.

English literature majors—Engl 120 and 194; Engl 112, 128, or 130; three semester hours of American literature; and 18 additional hours of courses offered by the English Department, of which at least 15 hours must be in English literature.

Minor in American or English literature—12 to 15 hours of second-group courses offered by the English Department, chosen in consultation with the advisor.

Master of Arts in the field of American literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) 24 semester hours of course work planned in consultation with the advisor on the basis of the student's undergraduate preparation, including a minimum of six semester hours in English literature; (2) a written Master's Comprehensive Examination; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major portion of the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Master of Arts in the field of English literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English or American literature, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) 24 semester hours of course work, planned in consultation with the advisor; (2) a written Master's Comprehensive Examination; and (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Doctor of Philosophy in the field of American literature—Required: the general requirements stated under the Graduate School of Arts and Sciences; Level

Two proficiency in an appropriate foreign language, or Level One proficiency in two appropriate foreign languages; the passing of a General Examination in the following four fields: (1) Early American literature—to 1815, (2) 1815–1900, (3) 1900 to present, (4) a fourth field, which may be either literary or interdisciplinary. Each student plans a program in consultation with a departmental committee.

Doctor of Philosophy in the field of English literature—Required: the general requirements stated under the Graduate School of Arts and Sciences; Level Two proficiency in an appropriate foreign language, or Level One proficiency in two appropriate foreign languages; the passing of a General Examination in four of the eight following fields: (1) beginnings to 1500, linguistics, and history of the language; (2) 1500–1660; (3) 1660–1800; (4) 1800–1900; (5) 1900 to present; (6) drama, including Shakespeare; (7) criticism; (8) American literature —one of the first three fields listed above under Doctor of Philosophy in the field of American literature. Each student plans a program in consultation with a departmental committee.

Bachelor of Arts in Education and Human Development with a teaching field in English—Prerequisite: the education curriculum; required: the English option and the professional courses stated under the School of Education and Human Development.

Departmental prerequisite: Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or written permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 117, 160–61–62, and 191–92.

Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, reading, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores or writing skill indicate superior competence will be allowed to waive Engl 10.

The admission of international students to any English course is determined by the English Placement Test for Foreign Students. Students should apply to the office of English for International Students to take this test (see Students from Foreign Institutions, under Admissions).

ENGLISH AS A FOREIGN LANGUAGE

English for International Students offers several noncredit special courses in addition to those listed below. For further information, request a program brochure from English for International Students, George Washington University, Academic Center T604, Washington, D.C. 20052.

First Group

15 **Intensive Basic English** (0) Wright and Staff
Introduction of basic grammatical structure through oral drill and practice, and of basic practical vocabulary. Course meets fifteen class hours and five monitored laboratory hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

20 **Intensive Lower-Intermediate English** (0) Wright and Staff
Continued basic grammar, reading, and vocabulary development; emphasis on oral skills. Course meets seventeen class hours and three monitored laboratory hours per week. Students registered in EFL 20 will not ordinarily be permitted to register for any other academic

course. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

30 **Intensive Intermediate English** (0) Wright and Staff
Introduction of complex grammatical structures, intensive reading, paragraph-level writing, and further vocabulary development and oral practice. Course meets eighteen class hours and two monitored laboratory hours per week. Students registered in EFL 30 will not ordinarily be permitted to take additional academic work unless approved by the advisor. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0) Wright and Staff
Comprehensive review of grammatical structures, enlargement of vocabulary through use of unadapted and technical reading material; development of effective reading strategies; composition focusing on outlining and techniques of exposition. Twenty hours per week. Students registered in EFL 40 will not ordinarily be permitted to take additional academic work unless approved by the advisor. Special-purpose sections are offered with business or technical emphasis. Tuition is charged at the rate of seven semester hours.

45 **Semi-Intensive Higher-Intermediate English** (0) Wright and Staff
Practice in composition writing; selective review of problematic grammatical structures; introduction to research techniques; development of reading and speaking skills and expansion of vocabulary through use of unadapted reading materials. Ten class hours per week. Tuition is charged at the rate of five semester hours.

50 **English Composition/Research Methods for International Students** (3) Wright and Staff
An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Students registered in EFL 50 must register for a full academic load. Special-purpose sections are offered with business or technical emphasis. Special fee, $25.

60 **Advanced Oral Communication** (3) Wright and Staff
An advanced-level conversation course for international students who show a high degree of academic proficiency in English. Development and practice of conversational skills using contemporary topics from newspaper and magazine articles, films, interviews, and guest lectures. Four class hours per week. Special fee, $25.

ENGLISH COMPOSITION

First Group

9 **English Composition: Language as Communication** (3) Claeyssens and Staff
Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. Class meets five hours per week. Special fee, $25. (Fall and spring)

10 **English Composition: Language as Communication** (3) Claeyssens and Staff
Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

11 **English Composition: Language and the Arts and Sciences** (3) Claeyssens and Staff
Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12 or 13. (Fall and spring)

12 **English Composition: Language in Literature** (3) Claeyssens and Staff
Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and diction, and on logical thought, by the study of literary genres, and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11 or 13. (Fall and spring)

13 **English Composition: Language and Ideas I** (3) Seavey, Shapiro
Study and practice of expository and argumentative techniques; emphasis on the rhetorical problems raised by different intellectual disciplines and different historical milieux. Prerequisite: Engl 9 or 10. To be taken only in conjunction with Hmn 1. Students who receive credit for Engl 13 cannot receive credit for Engl 11 or 12. (Spring)

14 **English Composition: Language and Ideas II** (1) Staff
Further practice in expository writing. To be taken only in conjunction with Hmn 2. (Fall)

Second Group

100 **Expository Writing in Accounting** (3) Claeyssens and Staff
Special emphasis on writing related to accounting and auditing, with weekly exercises on designated topics; selected readings. Prerequisite: Engl 9 or 10; 11; junior status. (Fall and spring)

101 **Advanced Expository Writing** (3) Claeyssens and Staff
Types of expository writing; weekly assignments based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12. (Fall and spring)

110 **Expository Writing for the Professions** (3) Staff
Weekly exercises based on students' individual needs; particular attention given to problems in writing for technically sophisticated readers. Selected readings. (Fall and spring)

Third Group

201–2 **The Teaching of Composition** (3–3) Claeyssens
(Academic year)

CREATIVE WRITING

102 **Introduction to Creative Writing** (3) Staff
Discussion of student poetry and/or prose fiction. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. (Fall and spring)

103 **The Writing of Fiction—the Short Story** (3) McAleavey
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall)

104 **The Writing of Poetry** (3) Staff
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration.

105–6 **The Writing of Plays** (3–3) Claeyssens
Same as SpDr 105–6. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration. (Academic Year)

107 **The Writing of Fiction—the Novel** (3) Claeyssens
Prerequisite: Engl 102 or 103; consent of instructor. The student should submit a writing sample to the instructor before registration. (Spring)

108 **Advanced Creative Writing** (3) McAleavey
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration.

ENGLISH LITERATURE

First Group

51–52 **Introduction to English Literature** (3–3) Rutledge and Staff
Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature. (Academic year)

61 **Tragedy** (3) Carter
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett. (Fall)

62 **Comedy** (3) Paster
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges. (Spring)

Second Group

111 **Medieval English Literature—Exclusive of Chaucer** (3) Allee

112 **Chaucer** (3) Allee
(Spring)

115 **History of the English Language** (3) Allee
Development of the English language in a historical treatment of English grammar.

116 **Medieval Legend and Saga** (3) Allee
Celtic and Norse. (Fall)

117 **Advanced English Syntax** (3) Allee
Study of English grammar through various approaches. Emphasis on syntax, including analysis of special syntactical problems.

120 **Practical Criticism** (3) Plotz
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

123 **Principles of Literary Criticism** (3) Carter
Works of major critics; consideration of ways in which literature is analyzed, classified, judged, and justified: Aristotle, Longinus, Dryden, Johnson, Coleridge, Schiller, Arnold, Eliot, Richards, Frye.

125–26 **Elizabethan Verse and Prose** (3–3) Quitslund
(Engl 125—spring)

127–28 **Shakespeare** (3–3) Highfill
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Earlier 17th Century** (3) Reesing
Poetry and prose to 1660, exclusive of Milton. (Fall)

130 **Milton** (3) Reesing

131–32 **English Literature, 1660-1780** (3–3) Highfill
Poetry and prose of the Neoclassic period. Engl 131: 1660–1740. Engl 132: 1740–1780.

133–34 **The Romantic Movement** (3–3) Plotz
Engl 133: Romantic views of childhood. Engl 134: Byron, Shelley, Keats. (Engl 133—fall)

135–36 **Victorian Literature** (3–3) Carter
Engl 135: Tennyson, Browning, Arnold; Dickens; Carlyle, Ruskin. Engl 136: George Eliot, Browning, Tennyson, Swinburne, Hardy, Hopkins, Wilde, Pater. (Academic year)

137–38 **The 20th Century** (3–3) Linton
Literature since 1900. Engl 137: poetry and criticism. Engl 138: drama and the novel. (Engl 138—fall)

145 **Special Topics in English Literature** (3) Staff
May be repeated for credit provided the topic differs. Topics announced in the *Schedule of Classes*. (Fall and spring)

149 **The Romantic Movement** (3) Combs
Poetry and prose, 1780-1830. Students who receive credit for Engl 149 cannot receive credit for Engl 133 or 134.

153–54 **The English Novel** (3–3) Maddox
Major novelists. Engl 153: 18th century. Engl 154: 19th century. (Academic year)

155–56 **The English Drama** (3–3) Paster, Highfill
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present. (Academic year)

157 **20th-Century Drama** (3) Paster
Representative continental, English, and American plays of the 20th century.

158 **20th-Century British Prose Fiction** (3)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300-1800)
Same as Fren/Ger/Hist/Phil/Rel 183 and Art 187.

191–92 **Introduction to European Literature** (3–3) Paster
Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid*; dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Open to freshmen and sophomores. May be taken to satisfy the requirement for meaningful initiation into the humanities. (Academic year)

194 **History of English Literature** (3) Reesing
(Spring)

195–96 **Proseminar in English Literature** (3–3) Paster
For field-of-study majors in English literature. Themes and concerns basic to the English literary tradition, which draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major in English literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

Third Group

212 Studies in Chaucer (3) — **Allee**

213 Old English (3) — **Allee**
Old English grammar and readings.

214 Beowulf (3) — **Allee**
Prerequisite: Engl 213 or equivalent.

215–16 **Viking Background for Medieval English** (3–3) — Allee
(Formerly Ger 213–14)
(Fall)

219 Research Methods and Bibliographical Materials (3) — **Broderick**
Principal bibliographical sources and typical problems in research. (Fall)

223–24 **Studies in Literary Criticism** (3–3) — Carter
(Engl 223—fall)

225–26 **Studies in 16th-Century English Literature** (3–3) — Quitslund

227–28 **Studies in Shakespeare and his Contemporaries** (3–3) — Paster

229 **Studies in English Literature, 1600-1660** (3) — Reesing
Chief figures exclusive of Milton. (Spring)

230 Studies in Milton (3) — **Reesing**

231–32 **Studies in English Literature, 1660–1780)** (3–3) — Highfill

233–34 Studies in the Romantic Movement (3–3) — **Plotz**
(Engl 234—spring)

235–36 Studies in Victorian Literature (3–3) — **Carter**

237–38 **Studies in 20th-Century Literature** (3–3) — Linton

253–54 **Seminar: The English Novel** (3–3) — Maddox
(Engl 253—spring)

255–56 **Studies in Dramatic and Theatrical History** (3–3) — Highfill
Studies in drama and theater of the Restoration and 18th century. Held at the Folger Shakespeare Library. (Spring)

299–300 **Thesis Research** (3–3) — **Staff**
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the English Department.

301–10 **Folger Institute Seminars** (3 credits each) — Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

398 **Advanced Reading and Research** (arr.) — **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

First Group

71–72 **Introduction to American Literature** (3–3) — Ganz and Staff
Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present. (Academic year)

Second Group

120 **Practical Criticism** (3) Plotz
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

160-61-62 **Studies in American Literature** (3–3–3) Romines, Combs, and Staff
Same as AmCv 160–61–62. The shaping of America's literary and cultural traditions as shown by major writers. Engl 160: The Colonial and Early National Periods: Bradstreet, Cotton Mather, Edwards, Franklin, Crevecoeur, and others. Engl 161: The Romantic Period: Poe, Emerson, Hawthorne, Melville, Thoreau, Whitman, Dickinson, and others. Engl 162: The Realist Period: Twain, James, Crane, Howells, Wharton, Chopin, Robinson, and others. (Engl 160, 162—fall; 161—spring)

163–64 **American Poetry** (3–3) Ganz
Close examination of major American poems. Engl 163: From the beginnings through the early 20th century: works by Bradstreet, Taylor, Poe, Emerson, Whitman, Dickinson, Robinson, Frost, and others. Engl 164: The 20th-century modernist poets: Stevens, Pound, Williams, Eliot, Ransom, Cummings, Crane, and others. (Academic year)

165–66 **American Drama** (3–3) Combs, Claeyssens
Historical and critical study of significant plays and forms. Engl 165: The life and works of Eugene O'Neill, and the dramatic techniques of Ibsen, Chekhov, and Strindberg which helped to shape 20th-century American drama; biographical and critical readings included. Engl 166: Significant and representative works of American theater, 1935–1975, including plays by Clifford Odets, Lillian Hellman, William Saroyan, Thornton Wilder, Arthur Miller, William Inge, Tennessee Williams, Eugene O'Neill, Carson McCullers, Lorraine Hansberry, and outstanding examples of musical comedy. (Academic year)

167–68 **The American Novel** (3–3) Maddox
Historical and critical study of major works in the American novelistic tradition. Engl 167: From beginnings through the 19th century: Hawthorne, Melville, James, Twain, Dreiser, Chopin, and others. Engl 168: The 20th century: Wharton, Anderson, Hemingway, Fitzgerald, Lewis, Faulkner, and others. (Academic year)

170 **The American Short Story** (3) Combs
An extensive survey of short fiction by a wide variety of writers of the 19th and 20th centuries, about half of them American; readings on the art of the short story by writers and literary critics included. (Spring)

171–72 **Major American Writers** (3–3) Staff
Each course may be repeated for credit provided the topic differs. Topics announced in the *Schedule of Classes*.

173–74 **Selected Literary Movements** (3–3) Romines
Each course may be repeated for credit provided the topic differs. Topics announced in the *Schedule of Classes*. (Engl 174—fall)

175 **Special Topics in American Literature** (3) Staff
May be repeated for credit provided the topic differs. Topics announced in the *Schedule of Classes*.

177–78 **Contemporary American Literature** (3–3) Ganz, Claeyssens
Major and representative works, 1946–1980. Engl 177: poetry, fiction, and non-fiction by Flannery O'Connor, Ginsberg, Kerouac, Rich, Lowell, Plath, Mailer, Roethke, Baraka, Berryman, Ashbery, and

others. Engl 178: essay, short story, and novel: Robert Penn Warren, J.D. Salinger, James Agee, E.B. White, Cheever, Nabokov, Welty, Wilder, Tillie Olson, Bellow, John McPhee. (Academic year)

181–82 **TBA** (3–3) TBA
Two special courses offered each year by the Jenny McKean Moore Visiting Lecturer in Creative Writing. Each course may be repeated for credit. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major in American literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in American literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Romines
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

Third Group

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

263–64 **Seminar: American Poetry** (3–3) Staff
American poets and critics of poetry.
(Engl 263—fall)

267–68 **Seminar: American Fiction** (3–3) McAleavey
Research and critical reading: fiction and the criticism of fiction. (Engl 268—fall)

281–82 **Seminar: Early American Literature** (3–3) Staff
(Engl 282—spring)

283–84 **Seminar: American Romanticism** (3–3) Broderick
Engl 283: Melville—the early fiction. Engl 284: Emerson, Thoreau, and the Concord Group: the intellectual background and the literary achievement. (Engl 283—spring)

285–86 **Seminar: American Realism, 1865-1915** (3–3) Romines, Sten
Realistic prose fiction in various contexts—literary, intellectual, cultural.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMANITIES*

43–44 **Classical Humanities** (3–3)
Lectures in the origins and development of Western civilization from approximately 3000 B.C. to 1300 A.D. Engl 43 considers the civiliza-

* Courses are offered off campus only.

tion of the Old Testament period and of Classical Greece through readings in the Old Testament and in Homer, Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Plato, and Aristotle. Engl 44 considers the civilization of the Roman Empire and of medieval Europe through readings in Virgil, Tacitus, St. Augustine, Aquinas, and Dante, and in medieval romance. Objective quizzes and one paper.

45–46 **Humanities in the Modern World** (3–3)
Lectures in the development of Western civilization from the 14th to the 20th centuries. Engl 45 considers Renaissance and Neoclassical culture through readings in Machiavelli, Cellini, Shakespeare, Cervantes, Bacon, Moliere, and Voltaire. Engl 46 considers aspects of Romanticism and Modernism manifested in works by Goethe, Flaubert, Zola, Nietzsche, Mann, Chekhov, and Joyce. Objective quizzes and one paper.

ENVIRONMENTAL AND RESOURCE POLICY—GRADUATE PROGRAM

Committee on Environmental and Resource Policy
H.C. Merchant *(Academic Director)*, E.O. Pederson

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in environmental and resource policy. The program is directed by the Committee on Environmental and Resource Policy and draws upon faculty and relevant courses from the various departments within the University.

The Environmental and Resource Policy Program presents in its core requirement a graduate-level examination of the specific areas that affect decisions made in the broad area of environmental and resource policy. This material includes the analytic tools required for decisions leading to effective policy regarding the environment and natural resources. In addition to mastering the core material, a student is also expected to develop specific competence in an area of particular interest by choosing an approved elective field. Prospective candidates should consult with the director of the Environmental and Resource Policy Program.

Master of Arts in the field of public policy with a concentration in environmental and resource policy—Prerequisite: a bachelor's degree with a *B* average (or equivalent) in a social science, natural science, or other relevant area from an accredited college or university, and an introductory course in statistics. Presentation of Graduate Record Examination scores is strongly recommended.

Required:

(a) The general requirements stated under the Graduate School of Arts and Sciences.

(b) Twenty-six hours of core courses selected from the following (students whose backgrounds include some of these courses may substitute additional courses in the elective field): BiSc/Chem/Phys 201 2; Econ 217, 237; EnHe 240; E&RP 210; PSc 203; Psyc 244; Stat 183 (or other appropriate statistical techniques course).

(c) Twelve hours of courses selected from those listed in one of the following elective fields. (Students are required to meet departmental prerequisites before enrolling in courses; check the conditions stated under the Graduate School of Arts and Science for receiving graduate credit for advanced undergraduate courses.)

Earth Sciences: Geog 107, 108, 136, 137, 219; Geol 105, 122, 128, 131, 175; Phil 271

Ecology: BiSc 140, 141, 143, 144, 167, 206, 208, 242, 243; Geog 290; Phil 271
Energy: Econ 235; EAd 221 *(Environmental Management)*; Geog 134; Phil 271; Phys 106; PSc 222, 223, 252, 288, 289; (the School of Engineering and Applied Science offers many technical courses relevant to this area, and some may be included in this program)
Resource Management: Econ 161, 162; Geog 132, 133, 222, 230, 290; Phil 271; Soc 127

(d) Comprehensive Project—taken at the completion of the student's program, the comprehensive project is the investigation of a specific problem in environmental and resource policy and the development of a proposed solution in a manner that integrates the core curriculum with the course work in the elective field.

210 **Seminar in Environmental and Resource Policy** (3) Staff
Limited to candidates in the Environmental and Resource Policy program; capstone course integrating the core and elective areas of the program. Provides practical experience in decision-making and serves as preparation for the comprehensive project.

ENVIRONMENTAL SCIENCE—GRADUATE PROGRAM

Academic Committee: S. Greenhouse, J. Millar, T. Vandemer

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Science in the field of environmental science. The curriculum is designed to provide an understanding of the environment with an emphasis on problems of the work place.

Master of Science in the field of environmental science—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university. Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Chem 205; Econ 217, 237; EnHe 201, 240, 256, 270, 301; PSc 224; Stat 127. An additional six credits are selected in consultation with the advisor. Each student must pass a Master's Comprehensive Examination.

ENVIRONMENTAL HEALTH

201 **Introduction to Epidemiology and Environmental Health** (3)
Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

240 **Environmental Impact Statement Procedures and Environmental Law** (3)
The rationale for environmental impact statements from the viewpoint of the nature and origins of environmental concerns. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment.

256 **Introduction to Environmental Health** (3)
Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry in carrying out control and preventive practices.

270 **Industrial Hygiene** (3)
Industrial health hazards: chemical exposure to toxic dusts, metallic fumes and vapors, gases, and organic compounds; physical hazards such as high and low temperature biological effects, radiation (elec-

tromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.

301 **Applied Epidemiology and Environmental Health** (3)
Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

ENVIRONMENTAL STUDIES

Committee on Environmental Studies

H. Merchant *(Chairman)*, T. Dietz, R.S. French, R.W. Kenny, W.C. Parke, W.E. Schmidt, A. Viterito, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. The program leading to the degree of Bachelor of Arts is designed for the student who is oriented toward participating in environmental decision-making with emphasis on the perspective of the social sciences. The program leading to the degree of Bachelor of Science is designed for the student with well-developed interests in science who seeks professional identification as a field or laboratory worker in the environmental sciences.

Bachelor of Arts with a major in environmental studies (departmental)—**The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):

(a) **Statistics—Stat 91.**

(b) Natural sciences—six to eight semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2, 21–22; or Phys 1, 2. Courses designated for nonscience majors must be passed with a grade of *A* or *B* to be accepted toward fulfilling the introductory natural science requirement. This includes BiSc 3–4 and Geol 1–2.

(c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; or Soc 1, 2.

3. Required courses in the major (51 semester hours):

(a) **BiSc 140; Econ 136; Geog 132.**

(b) Eight semester hours selected from BiSc 101, 102, 103, 105, 106, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 143, 144, 145, 149, 161, 167, 168, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, 272; Phys 14, 15, 16, 106, 127–28.

(c) 24 semester hours in courses selected from *two* departments in the following—Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 142, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) **Envr 151–52, 157.**

Bachelor of Science with a major in environmental studies (departmental)—**The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):

(a) Statistics—Stat 91.

(b) Natural sciences—12 to 16 semester hours selected from BiSc 11–12; Chem 11–12; Geol 21–22; Phys 1, 2. Either BiSc 11–12 or Chem 11–12 must be selected.

(c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; Soc 1, 2.

3. Required courses for the major (51 semester hours):

(a) BiSc 140; Econ 136; Geog 132.

(b) 23 semester hours selected from BiSc 101, 102, 103, 105, 106, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 143, 144, 145, 149, 161, 167, 168, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, 272; Phys 14, 15, 16, 106, 127–28.

(c) 9 semester hours selected from Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 142, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) Envr 151–52, 157.

The science and social science courses listed under 3(b) and 3(c) above must be taken in not more than *three* departments. Not more than six hours of service-learning courses may count toward fulfilling requirements of the major.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and that a maximum of 12 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd 101, 171, 201, 203; *CE 194, 197; HKLS 152; U&RP 153, 201, 205. The permission of the instructor, the department chairman, and the Dean of the School of Government and Business Administration is necessary to take graduate courses (numbered 201 and above) in that School.

151–52 **Senior Seminar in Environmental Studies** (3–3) Staff
Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

157 **Introduction to Environmental Law** (3)
An introduction to selected pieces of major environmental legislation. The role of the courts and bureaucracy in implementing and interpreting legislation. Impact on decision-making. Designed for students with no training in law.

158 **Special Topics in Environmental Law** (3)
Analysis of environmental laws which focus on a particular environmental issue. Topics will vary. Prerequisite: Envr 157 or permission of instructor.

159–60 **Field Experience** (3–3)
Open to juniors and seniors majoring in environmental studies. Students will spend at least eight hours per week in a political, technical, legal, or special interest organization working on environmental questions.

FORENSIC SCIENCES—GRADUATE PROGRAMS

Professors T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chairman)*
Adjunct Professor C.G. McWright

* See the *School of Engineering and Applied Science Bulletin* for civil engineering courses.

Professorial Lecturers B.J. White, C.B. Cunningham, L.R. Goldbaum, R.L. Thompson, E.G. Howe

Associate Professors N.T. Lappas, W.F. Rowe

Associate Professorial Lecturers J.T. Smith, G.M. Saiger, C.E. Bohn, J.L. Melnick, K.E. Melson, D.S. Dixon, R.H. Parker, J.P. Hume, B.W. Given, S.H. Manne, J.D. Spencer, W.A. Bayse, M.M. Levy, R.P. Beliles, M.S. Clark, A.R. Josselson

Assistant Professorial Lecturers M. Stajic, J.L. Lyons, D. Beard, J. Blumenfeld, J. Harris, S.R. Lorigo, C.E. Bruce, R.E. Easton, T.M. Fortuin, J.T. Kotelly, J.L. Mudd, H.J. Volzer

Master of Forensic Sciences—Prerequisite: a bachelor's or a graduate degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological, or physical sciences, or law, medicine, or law enforcement.

Required: the general requirements stated under the Graduate School of Arts and Sciences. For students not electing a thesis, 36 semester hours of course work are required; for students electing a thesis, 30 semester hours of course work, plus a thesis (equivalent to six semester hours), are required. ForS 220, 221, 224, and 225 are required of all students. ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited law school. The following are also required: (1) nine hours selected from ForS 201, 202, 203, 204, and 205; (2) nine hours selected from ForS 214, 260, 261, 265, and 269; (3) the remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

Master of Science in the field of chemical toxicology—Prerequisite: completion of the first three years of the combined B.S./M.S. program in chemical toxicology (see Chemistry Department) or its equivalent. Courses may be required to remove academic deficiencies.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The following courses are required: Bioc 221–22; Phyl 191; Phar 203; ForS 240, 242, 245; two courses selected from ForS 246, 248, 249, 269; ForS 299–300 or Chem 299–300. Chem 131, 141, 142 and Stat 127 will be required of students who have not had these courses or their equivalent. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

Master of Science in Forensic Science—Prerequisite: a bachelor's or graduate degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to six semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination. Candidates must also fulfill the tool requirement by passing a reading knowledge examination in French, German, or Russian, or by

satisfactorily completing the tool requirement in either statistics or computer programming.

Master of Arts in the field of criminal justice—Prerequisite: a bachelor's or graduate degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work drawing from the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 214, 220, 221, 224, 225, 228, 265, 266, 274, 290; Soc 259, 261 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement. It is strongly recommended that students participate in the forensic sciences practicum.

Master of Arts in the field of crime in commerce—Prerequisite: a bachelor's degree or graduate degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, accounting, computer science, investigative techniques, and management. ForS 203, 224, 225, 229, 232, 233, 234, 235, 251, 267, 274, and Stat 197 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement. It is strongly recommended that students participate in the forensic sciences practicum.

The interdisciplinary programs leading to the degrees of Master of Arts, Master of Forensic Sciences, and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, from the National Law Center, from the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology and with the Council of Higher Education, Commonwealth of Virginia, in programs of mutual exchange of students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

201 **Forensic Serology I** (3) Lappas, Mudd
Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology. Laboratory exercises.

202 **Instrumental Analysis** (3) Perros, Rowe
Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry. Laboratory exercises.

203 **Examination of Questioned Documents** (3) Bohn
Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3) Cunningham, Rowe
Methods for identifying firearms, cartridge casings, tool-marks, tire marks, and footprints. Laboratory exercises.

205 **Personal Identification** (3) Given
Methods of personal identification based on sketches, fingerprints, voiceprints, odontology, and study of skeletal remains.

214 **Forensic Psychiatry** (3) Howe, Saiger, Smith, Manne
Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Physical Aspects of Forensic Sciences** (3) O'Rear, Rowe
Survey of forensic physical sciences; fingerprints, firearm and tool-mark examinations, document examinations, and examinations of trace evidence such as glass, soil, paint, hairs, and fibers; crime scene investigations; qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.

221 **Biological Aspects of Forensic Sciences** (3) Lappas, Rowe
Principles of forensic pathology, serology, and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials; and the detection of drugs in biological materials.

224 **Criminal Law I** (3) Starrs, Hume, Melnick, Bruce
Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 **Criminal Law II: Evidence** (3) Melson, Melnick, Volzer
Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 **Criminal Law III: Procedure** (3) Starrs
Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Prerequisite: ForS 224.

228 **Administration of Criminal Justice** (3) Blumenfeld, Volzer
Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

229 **Criminal Law IV: Contracts** (3) Easton, Harris
Concepts and principles of law encountered in commercial activities: contracts, sales, negotiable instruments, and bankruptcy. Emphasis on recognition of deceptive contracting practices. Statutes and government regulation governing contracts.

232 **Crime in Commerce I: Accounting** (3) Levy, Lorigo
Principles of accounting; abuse and misuse of accounting procedures; use of accounting in the investigation of commercial crime.

233 **Crime in Commerce II: Procurement and Supply** (3) Levy, Lorigo
Governmental and private sector procurement procedures; techniques of inventory management; abuse of procurement procedures and illicit diversion of supplies.

234 **Crime in Commerce III: Information Systems** (3) Bayse
Principles of management information systems; security of information system and facilities; compromising of information systems.

235 **Crime in Commerce IV: Conspiracy** (3) Fortuin, Kotelly
Legal definition of conspiracy; quantum of proof; use of investigative techniques to establish the existence of criminal conspiracies.

240 **Principles of Toxicology** (4) Lappas
Concepts of toxicology including its historical development and modern applications, drug disposition, mechanisms of toxicity; factors which influence toxicity and toxicity evaluation.

242 **Chemistry of Organic Medicinal Agents** (3) O'Rear
A correlated study of the compostion, constitution, physical and chemical properties and pharmaceutical uses of organic medicinal agents. Included are discussions of the heterocyclic chemistry of these agents.

245 **Analytical Toxicology** (4) Lappas
A study of qualitative and quantitative principles and procedures used in the detection, identification, isolation, purification and potency determination of drugs. Laboratory.

246 **Environmental Toxicology** (3) Beliles
A study of the chemical substances to which humans are unintentionally exposed. Emphasis will be placed on pesticides, food additives and air pollutants.

248 **Clinical Toxicology** (3) Staff
A study of the adverse effects caused by or related to the use of drugs. The signs and symptoms, diagnoses and treatments will be emphasized.

249 **Industrial Toxicology** (3) Staff
A study of the potential hazards encountered by workers as a result of their exposure to raw materials, intermediates and finished products. The types of exposure and methods of predicting and preventing toxic exposure will be emphasized.

250 **Interdisciplinary Aspects of Forensic Science** (3) Starrs, Volzer
Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs. individualized evidence, and search and seizure. Prerequisite: ForS 224.

251 **Moot Court** (3) Blumenfeld
Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.

254 **Selected Topics in the Forensic Sciences** (3) Staff
Current issues in research, investigation, and law.

260 **Principles of Forensic Medicine** (3) Spencer
Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3) Spencer
Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **Drugs of Abuse** (3) Lappas, O'Rear, Stajic
Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear, Courtless
Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

267 **Seminar: Crime in Commerce** (3) Levy, Lorigo
Interdisciplinary course in current problems in the investigation and prosecution of commercial offenses.

268 **Photography in the Forensic Sciences** (3) Spencer
Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee, $25.

269 **Forensic Toxicology I** (3) Lappas, Stajic
Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

270 **Medicinal Chemistry** (3) O'Rear
Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

271 **Forensic Serology II** (3) Lappas, Mudd
Methods in forensic serology. Laboratory examinations and classifications of dried blood and other biological materials. Independent laboratory projects. Laboratory fee, $25. Prerequisite: ForS 201, or permission of instructor.

272 **Forensic Toxicology II** (3) Lappas, Stajic
Lectures, student seminars, laboratory exercises, and projects dealing with topics of current interest in forensic toxicology. Prerequisite: ForS 269 or permission of instructor. Laboratory fee, $25.

273 **Forensic Chemistry I** (3) Rowe
Examination of glass, soils, hairs, and fibers. Laboratory exercises include refractive index measurements using immersion methods; polarized light observations of minerals, hairs, and fibers; elemental analysis of glass and soil by spectroscopic methods; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, $25.

274 **Management of Criminal Justice Organizations** (3) O'Rear, Parker
Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

280 **Forensic Chemistry II** (3) Rowe
Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrophotometry and pyrolysis—gas-liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: ForS 273. Laboratory fee, $25.

290 **Research in Criminal Justice** (3) Courtless
An examination of the role and process of research as it serves the criminal justice systems. Presentations and discussions of the literature with emphasis on the use of research and analysis in formulating and evaluating criminal justice policy.

295 **Research** (arr.) Staff
Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

298 **Forensic Sciences Practicum** (1) Staff
Open to qualified Master's degree students. Internship experience in a forensic science laboratory or criminal justice agency, under the supervision of an appropriate staff member. Students must preregister

for this course. Credit for the course cannot be used toward the 36 semester hours required for the Master's degrees.

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

FRENCH

See **Romance Languages and Literatures.**

GENERAL CURRICULUM IN THE LIBERAL ARTS

Bachelor of Arts: General Curriculum in the Liberal Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. *Humanities*—39 semester hours:

(a) 6 semester hours selected from Engl 9 or 10, 11 or 12, 101.

(b) 18 semester hours (of which 6 semester hours must be in a foreign language) selected from Chin 163–64; Clas 71, 72, 108, 113; Engl 51–52, 61–62, 71–72, 127–28, 153–54, 155–56, 160 in combination with 161 or 162, 163–64, 165–66, 167–68, 170, 191–92; Fren 51–52, 60 in combination with 51 or 52, 91–92; Ger 51–52, 103–4, 111–12, 126, 161–62; Slav 91–92; Span 51–52, 91–92.

(c) 6 semester hours selected from Phil 111, 112, 113.

(d) 3 semester hours selected from Rel 9, 10, 21, 59, 60, 103, 104, 105, 107, 111, 113, 114, 115, 116, 128, 137, 143, 144, 145.

(e) 6 semester hours selected from Art 1, 31–32, 71–72, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 140, 145, 147, 148, 149, 150, 155, 156, 161, 162, 165, 167, 169–70; Mus 3, 4, 7, 101–2, 103–4, 109, 110, 121, 125; SpDr 45, 49, 126, 143, 144, 165–66.

3. *Social Sciences*—18 semester hours:

(a) 6 semester hours selected from Hist 108, 109, 110, 111–12, 121, 122, 123–24, 171–72, 175–76, 179–80, 183.

(b) 6 semester hours selected from courses in economics; or 6 semester hours selected from courses in political science.

(c) 6 semester hours selected from courses in American civilization, anthropology, geography and regional science, psychology, or sociology.

4. *Natural and Mathematical Sciences*—18–22 semester hours:

(a) 6–8 semester hours in each of two laboratory sciences selected from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2 or 21–22; Phys 1–2 or 9–10.

(b) 6 semester hours selected from courses in mathematics (excluding Math 3 and 6).

5. *Electives*—41 semester hours of courses selected in consultation with the advisors.

A major is optional. If a student chooses a major, elective courses may be used to fulfill the requirements for it.

The requirement of 6 semester hours of literature in a foreign language may be fulfilled by selection from any of the first- or second-group foreign-language courses in literature. The requirement presupposes foreign-language competency, which a student may achieve, if necessary, through elective courses.

A student must pass a minimum of 36 semester hours of second-group courses. By passing an examination administered or authorized by the appropriate department, a student may waive introductory courses that are prerequisite to more advanced courses.

GENETICS—GRADUATE PROGRAMS

Committee on Genetics

S.O. Schiff *(Chairman)*, W.F. Anderson, A.M. Attalah, D.J. Brusick, R. Crystal, R.F. De Giovanni-Donnelly, W. Drohan, E.M. Earley, R.C. Gallo, C.T. Garrett, C.B. Jacobson, D.E. Johnson, P.D. Kind, K. Krell, A. Kumar, J.W. Larsen, W.M. Leach, R. Mage, C.R. Merril, W.G. Nash, P. Noguchi, S. O'Brien, J.C. Petricciani, D. Picciano, K.N. Rosenbaum, M. Schanfield, J. Schlom, J. Schulman

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Anatomy, Biochemistry, Biological Sciences, Microbiology, Obstetrics and Gynecology; and from government agencies and private industry.

A bachelor's degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: eight semester hours each in biology, inorganic chemistry and organic chemistry; six semester hours in physics; and six semester hours in English composition and literature. While not required for admission, courses in embryology, genetics, and mathematics are strongly recommended.

Master of Science in the field of genetics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The 30 semester hours required in this program must include Gnet 201 and Gnet 299–300. The remaining 22 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from the departmental courses listed below. The tool requirement may be met by satisfactorily completing an approved course in biostatistics or by passing a foreign language reading examination.

Doctor of Philosophy in the field of genetics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study must include Gnet 301, eight to 10 semester hours of biochemistry, six to eight semester hours of cell biology, 10 to 12 semester hours of genetics, and three semester hours of statistics. These courses may be selected from the departmental listings below. The tool requirement may be met by the satisfactory completion of an approved course in biostatistics and the passing of a foreign language reading examination, preferably in French or German.

GENETICS

Third Group

201 **Advanced Problems in Genetics** (2) **Staff**
Lectures on selected topics by members of the Committee on Genetics. Required of all master's degree candidates in the Genetics Graduate program. (Fall)

295 **Research** (arr.) **Staff**
Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Academic year)

Fourth Group

301 **Advanced Problems in Genetics** (2) Staff
Lectures on selected topics by members of the Committee on Genetics. Required of all Ph.D. candidates in the Genetics Graduate program. (Fall)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANATOMY

203 *Human Developmental Anatomy* (1)

BIOCHEMISTRY

221–22 *General Biochemistry* (3–4)
229 *Biochemistry of Enzymes* (2)
232 *Protein Chemistry* (2)
250 *Cell and Molecular Biology* (3)
252 *Biochemical and Molecular Aspects of Selected Diseases* (2)
256 *Biochemical Genetics and Inherited Metabolic Diseases* (1 or 2)

BIOLOGICAL SCIENCES

Biology

111 *Introductory Microbiology* (4)
122 *Cell Biology* (3)
123 *Cell Biochemistry* (3)
124 *Cell Biochemistry Laboratory* (2)
127 *Genetics* (3)
128 *Genetics Laboratory* (1)
138 *Advanced Genetics* (3)
167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)
220 *Seminar: Cell or Plant Biochemistry* (3)
227 *Seminar: Genetics* (3)
228 *Population Genetics* (3)
229 *Cytogenetics* (3)
230 *Human Genetics* (3)
248 *Analysis of Development* (3)
249 *Seminar: Developmental Biology* (3)
272 *Electron Microscopy* (3)

Zoology

145 *Introduction to Vertebrate Embryology* (4)
146 *Experimental Developmental Biology* (4)
212 *Seminar in Comparative Reproductive Biology* (3)

ELECTRICAL ENGINEERING

51 *Applications of Computers* (3)

MICROBIOLOGY

211 *Microbiology* (4)
214 *Tissue Cell Culture* (3)
219 *Scientific Writing* (1)
229 *Immunology* (3)
230 *Immunology Laboratory* (2)
231 *Immunobiology* (1)
233 *Virology* (3)
234 *Virology Laboratory* (2)
258 *Microbial Genetics* (2)
260 *Cellular Immunology* (1)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology* (3)
222 *Genetic Toxicology* (2)
258 *Cancer Chemotherapy* (1)

STATISTICS

91 *Principles of Statistical Methods* (3)
107 *Introduction to Computing* (3)
127 *Statistics for the Biological Sciences* (3)

GEOBIOLOGY—GRADUATE PROGRAMS

Committee on Geobiology
A.G. Coates *(Chairman)*, M.A. Buzas, R.E. Knowlton, D.L. Lipscomb, H. Merchant, A. Viterito

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of geobiology. The program is directed by a committee whose members are drawn from the Departments of Biological Sciences, Geography and Regional Science, and Geology. It is enhanced by cooperative relationships with the Smithsonian Institution and U. S. Geological Survey.

A bachelor's degree in biology, botany, geology, or zoology from this University, or an equivalent degree from another accredited institution of higher learning, is required for admission to the program. Prerequisite University courses (or equivalent courses elsewhere) include the following: BiSc 101 or **104, 108, 127, 140; Geol 22, 151 or 154, 166; Stat 91.**

Master of Science in the field of geobiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 30 semester hours of course work, plus a thesis (equivalent to six semester hours). Required courses include BiSc 107, 208, 209; Geol 195, 254, and 255. Electives are selected from the following (to total, with the required courses, at least 30 semester hours): BiSc 102, 103, 105, 106, 110, 138, 141, 143, 144, 162, 168, 204, 207, 211, 228, 229, 237, 242, 243; Geog 104, 106, 108, 219, 220; Geol 105, 125, 128, 152, 154, 158, 163, 175, 181, 241, 258, 263, 266.

Doctor of Philosophy in the field of geobiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 48 semester hours of course work, plus a dissertation (equivalent to 24 semester hours). Required courses include: BiSc 107, 208, 209, 211, 228; Geol 125, 195, 254, 255, 263. Electives are to be selected from remaining elective

courses listed for the master's degree (to total, with the required courses, at least 48 semester hours).

Research fields: animal ecology, climatology, evolution, genetics, geomorphology, hydrology, invertebrate zoology, invertebrate paleontology, lower plants, marine ecology, marine biology, micropaleontology, paleoecology, plant ecology, sedimentary geology, stratigraphy, vertebrate paleontology, vertebrate zoology.

GEODESY

See **Geography and Regional Science.**

GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon, J.C. Lowe *(Chairman)*
Professorial Lecturers E. Marasciulo, J. Pickard
Associate Professor E.O. Pederson
Associate Professorial Lecturer J.A. Zinn
Assistant Professor A. Viterito
Assistant Professorial Lecturers S.E.S. Mastran, J. Banister, D.S. Kamerling
Lecturer D.D. Selden

Bachelor of Arts with a major in geography (departmental)—**The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Required courses in the major—Geog 1 or 2 and 3; 30 semester hours of second-group geography and regional science courses, including Geog 105, to be chosen in consultation with the undergraduate advisor.

Minor in geography—Required: one course from each of the following groups: cultural, population, and political geography: Geog 127, 145, 146; economic geography: Geog 2, 125, 141; physical geography: Geog 107, 108; resource management: Geog 132, 134, 135; urban geography: Geog 140, 142, 143.

Master of Arts in the field of geography—Prerequisite: a Bachelor of Arts degree with a major in geography from this University, or an equivalent degree. Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 30 semester hours of approved course work including a thesis; with the approval of the department, a student may elect a program of study without a thesis, but must then complete 36 hours of approved course work. A Master's Comprehensive Examination is required. Candidates must fulfill the tool requirement in one of three ways: (1) passing a reading knowledge examination in an approved foreign language; (2) satisfactorily completing six semester hours in statistics selected from Stat 105, 118, 119, 133, 155, 159, 187, 188; or (3) satisfactorily completing two of the following courses: Stat 108, 114, 135, 146, 148, 149.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see **Geobiology.**

Associate in Science in Cartographic Science—The following requirements must be fulfilled:

1. The general requirement in English stated under the Division of Continuing Education and Summer Sessions.
2. Prerequisite: Cart 1 and 2.
3. Required courses in related areas: Math 31, 32; Geod 12, 17, 106; at least two courses in geology or oceanography.

4. Required courses in the major: Cart 102, 104, 111, 115, 116, and 125 or 126. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor.

Associate in Science in Geodesy—The following requirements must be fulfilled:

1. The general requirement in English stated under the Division of Continuing Education and Summer Sessions.
2. Prerequisite: Geod 17.
3. Required courses in related areas: Math 31, 32, 33, 124; Phys 1 or 3; Cart 107.
4. Required courses in the major: Geod 106, 110, 150, 160; at least one course selected from Geod 117, 151, 156, 161, 165–66. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor.

Bachelor of Science in Cartographic Science—The following requirements must be fulfilled:

1. The general requirements stated under the Division of Continuing Education and Summer Sessions.
2. Prerequisite: Cart 1 and 2.
3. Required courses in related areas: Math 31, 32, 33; Geod 12, 13, 17, 18, 106, 110. At least four courses selected from: Geol 1–2 or 21–22; Ocea 103–4.
4. Required courses in the major: Cart 102, 104, 107, 108, 111, 115, 116, 120, 121, 125 or 126, and 131. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor.

Bachelor of Science in Geodesy—The following requirements must be fulfilled:

1. The general requirements stated under the Division of Continuing Education and Summer Sessions.
2. Prerequisite: Geod 17 and 18.
3. Required courses in related areas: Phys 1 or 3, 15; Math 31, 32, 33, 124; Cart 107; Geol 1 or 3, 21; Ocea 103–4, 105.
4. Required courses in the major: Geod 106, 110, 150, 151, 160, 161; at least four courses from Geod 117, 156, 158, 165–66. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor.

Bachelor of Arts in Education and Human Development with a teaching field in geography—Prerequisite: the education curriculum; required: the geography option and the professional courses stated under the School of Education and Human Development.

GEOGRAPHY AND REGIONAL SCIENCE

First Group

1 Introduction to Geography (3) Staff
A systematic survey of human geography, stressing the organization of space and the role of the environment. (Fall and spring)

2 Introduction to Economic Geography (3) Staff
Examination of the basic principles which determine the location of economic activities. (Spring)

3 **Introduction to Physical Geography** (3) Viterito
A study of the earth's physical environment, its systems, subsystems, and physical processes. Laboratory fee, $25. (Fall)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

104 **Special Techniques in Cartography** (3) Staff
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $25. (Spring)

105 **Scope and Methods of Geography** (3) Viterito
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. Admission by permission of instructor. (Fall)

106 **Remote Sensing** (3) Viterito
Examination of the principles and applications of remote sensing techniques using color infra-red, microwave, and satellite imagery. Laboratory fee, $25. (Spring)

107 **Air Photo Interpretation** (3) Viterito
(Formerly Meteorology)
Use of aerial photography for problems in land use, urban analysis, archaeology, and environmental monitoring. Laboratory fee, $25. (Fall)

108 **Weather and Climate** (3) Viterito
An examination of atmospheric processes and climatic regions. Laboratory fee, $25. (Spring)

110 **Geography of Desertification** (3) Viterito
Man, climate, and change in arid regions. (Spring)

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Same as AmCv/Anth 115.

124 **Urban Transportation** (3) Lowe
The relationship between freight and passenger transportation systems and urban land use patterns and structure. (Spring)

125 **Transportation Geography** (3) Lowe
The structure and evolution of transportation and communication networks and their impact on regional development. (Fall)

127 **Population and Settlement** (3) Gordon
Patterns of world population; factors contributing to population pressures, growth, and migrations. (Spring)

132 **Resource Management and Conservation** (3) Staff
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies. (Fall)

133 **Geography of Hunger** (3) Gordon
(Formerly Food and Regional Development)
Spatial disparities in world food production, demand, and distribution; regional food–population balances; food supply problems and prospects. (Fall)

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* An interdepartmental course offered by the Geography and Regional Science, East Asian Languages and Literatures, Economics, History, Philosophy, Political Science, and Religion Departments.

134 **Geography of Energy Resources** (3) Staff
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations.

135 **Resources and Environmental Quality** (3) Staff
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence man's use of resources. (Spring)

136 **Geography of Water Resources** (3) Viterito
Investigation of the hydrologic cycle, focusing on precipitation, infiltration, and surface runoff. Laboratory fee, $25. (Spring)

137 **Environmental Hazards** (3) Viterito
Examination of natural hazards in terms of their types, distributions, and impacts on human activities. (Spring)

140 **Urban Geography** (3) **Pederson**
Analysis of the internal spatial structure of cities; emphasis on explaining patterns of location within the city. (Fall)

141 **Urban Settlement** (3) **Pederson**
The location of cities, urbanization processes, theories and models of urban location and development.

142 **Urban Environments** (3) **Lowe**
Perspectives on urban service delivery and the physical geography of the city.

143 **Social Geography** (3) **Lowe**
Behavioral perspectives on human spatial activities in cities. (Spring)

145 **Cultural Geography** (3) Staff
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations. (Fall)

146 **Political Geography** (3) Pederson
Interrelationships among the human and physical environment and political systems; the organization of political territories. (Fall)

151 **Geography of U.S. and Canada** (3) Staff
An examination of the social, environmental, and economic factors which have led to development of the several regions of the U.S. and Canada.

154 **Geography of the Middle East** (3) Gordon
Cultural and physical regional patterns of the Middle East. (Fall)

161 **Geography of Latin America** (3) Gordon
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. (Fall)

189–90 **Readings in Geography** (arr.) **Staff**
(Academic year)

198 **Topics** (3) **Staff**
Consideration of geographic aspects of topical and future problems of society. May be repeated for credit provided that the topic differs.

199 **Practicum** (3) Staff
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography.

Third Group

219 **Seminar: Climatology** (3) Viterito
Atmospheric circulation systems, controls, and distribution. Elements of synoptic climatology, including climate modeling. (Spring)

220 **Seminar: Climatic Change** (3) Viterito
Climatic history; examination of natural and induced climatic change.

222 **Seminar: Resources and the Environment** (3) Staff
Analysis of the spatial variations and interrelationships of resources and the environment. (Spring)

223 **Seminar: The Population-Food Balance** (3) Gordon
Spatial problems associated with the dynamics and interaction of population growth and agricultural output.

224 **Seminar: Political Geography** (3) Pederson
Examination of the political factor in location theory and analysis of the nature of political territories.

225 **Seminar: Transportation Geography** (3) Lowe
Transportation and communication in the organization of space. (Fall)

230 **Seminar: Spatial Implications of Resource and Environmental Policy** (3) Staff
A consideration of the differential regional implications of and responses to resource and environmental policy decisions owing to regional differences in societal and physical parameters.

243 **Seminar: Urban Geography** (3) Lowe
Evolving morphology and internal spatial patterns of cities. (Fall)

244 **Seminar: Urban Systems** (3) Pederson
Central place theory and other theories of urban location and the organization of systems of cities. (Spring)

250 **Regional Development** (3) Gordon
Geographic perspectives on the policy, planning, and programmatic aspects of regional development.

261 **Seminar: Geography of Latin America** (3) Marasciulo
Selected topics related to population, environment, and land use in Latin America. (Fall)

265 **Seminar: Geography of the Soviet Union** (3) Weber
Survey of USSR regions and major topical themes of Soviet geography, including population, energy, agriculture, transportation, and regional development. (Spring)

266 **Seminar: Geographic Perspectives on Contemporary China** (3) Banister
China's development prospects: environmental constraints, population growth, and regional differences in context of Chinese cultural patterns and political organization. (Fall)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Hist/Span 287 and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Boulier
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Boulier
Same as Econ 291.

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

CARTOGRAPHY*

1 Cartography I (3)
Introduction to the fundamental concepts and practical applications of cartography.

2 Cartography II (3)
Aerial photography, modern topographic and hydrographic mapping and charting, thematic maps, map reliability, planning and design, and reproduction.

102 Elements of Remote Sensing (3)
Basic elements of remote sensing. Emphasis on the electromagnetic spectrum, infrared photographic systems, thermal systems, and analysis of multispectral photography and thermal imagery. General characteristics of satellite remote sensing.

104 Photo-interpretation (3)
Interpretation of topographic, vegetative, hydrologic, and man-made features. Civil and military applications. Applications to urban planning and urban-industrial patterns. Use of satellite imagery and remote sensing data. Color aerial photographs and underwater photography. Prerequisite: Cart 102.

107 Physiography (3)
Development of physiographic concepts; the earth's crust, weathering, climate, and denudation; stream, shore, wind, and ice processes; glaciation; physiographic regions.

108 Climatology (3)
Causes for climate and weather, air mass movements, water mass movements, physical features of boundaries. Tropics, subtropics, humid and dry continentals, subarctics.

111 Cartographic Techniques (3)
Techniques and procedures, field methods, evaluation of source material, use of scribing and contact screens in color separation, shaded relief, and reproduction. Lectures and laboratory. Prerequisite: Cart 2. Material fee, $21.

113 Map Design (3)
Functional requirements of various kinds of maps. Principles of human perception and visual communication. Influence of reproduction processes on map design. Optimizing results within constraints of available source material, equipment, time, money, manpower, and reproduction process. Changing tradition of map design. Influence of experimental work and progress in the commercial and fine arts on map design. Role of map design in mapping organizations. Prerequisite: Cart 1.

115 Cartometrics I (3)
Examination of the application of automatic computing systems to cartography. Course will cover batch processing and time sharing and dedicated minicomputer systems as well as digitizers, plotters, and graphic terminals. Prerequisite: Cart 1 or 2.

116 Cartometrics II (3)
Analysis of cartographic computing programs, cartographic data structures, and automated mapping data bases. Examination of FORTRAN programming methods as they apply to cartography. Preparation of coordinate transformation programs, map projection programs, and plotting software. Prerequisite: Cart 115. Laboratory fee for computer use.

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* Courses are offered off campus only.

120 Computer Mapping I (3)
The analysis and application of computer mapping methods; techniques for the automation of data bases and the creation of computer generated map output. Students will develop application programs in laboratory sessions. Prerequisite: Cart 1 or 2. Laboratory fee for computer use.

121 Computer Mapping II (3)
Advanced applications of computer mapping methods and applications that include 2- and 3-dimensional automated plotter programs. Course will include laboratory sessions and students will develop an advanced seminar project. Prerequisite: Cart 120. Laboratory fee for computer use.

125 Marine Cartography (3)
Exploring the extended and imaginative symbology required to depict a visually opaque environment characterized by sparsity of data; the thematic aspects of oceanographic mapping. Prerequisite: Cart 2.

126 Topographic Mapping (3)
Application of control surveys and photogrammetry to topographic mapping. National Map Accuracy Standards. Systematic application of geographic names. Field completion. Feature classification and symbolization. Map compilation and color separation. Comparison of American and foreign topographic maps and methodologies. Prerequisite: Cart 107, 111; Geod 12, 13.

128 Thematic Mapping (3)
Analysis of the thematic map as a means of communicating qualitative and quantitative data. The function and design of base maps for thematic overprints. Source material research, analysis, and manipulation. Map layout and symbol design. Experimental studies to compare the data the cartographer intends to communicate with the map and that actually extracted by the reader. Prerequisite: Cart 1 or 2.

131 Techniques in Remote Sensing (3)
The application of remote sensing to earth resource studies with emphasis on the physical characteristics of electromagnetic radiation, multispectral sensing, and photographic and digital image analysis. Satellite systems and the cartographic treatment of remote sensing data. Prerequisite: Cart 102.

GEODESY*

12 Plane Surveying (3)
Basic plane surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Math 30.

13 Higher Surveying (3)
Elements of geodetic and hydrographic surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Geod 12 and Math 32.

17 Elementary Photogrammetry (3)
Fundamentals of aerial photography, photogrammetric optics, and photographic processes; mathematics of vertical and tilted photographs; stereoscopy and parallax; planning and executing the photogrammetric project; radial triangulation methods; photomaps; oblique and terrestrial photography.

18 Intermediate Photogrammetry (3)
Basic theory and practices. Stereoscopic plotting instruments; graph-

* Courses are offered off campus only.

ical and computational methods for adjusting strips of aerotriangulation. Method of least squares, statistics and transformations applied to photogrammetry. Prerequisite: Geod 17.

106 Physical Science Data Analysis (3)
Elementary analysis of cartographic, geodetic, and oceanographic data. Basic concepts of probability, sample statistics, probability distributions, confidence intervals, estimation, and tests of hypotheses as related to cartographic, geodetic, and oceanographic data. Prerequisite: Math 31.

110 Map Projections (3)
Elementary theory of projections in cartography and geodesy. Projection of the sphere and ellipsoid on plane, conical, and cylindrical surfaces. Prerequisite: Cart 1.

117 Analytic Photogrammetry (3)
Analytic photogrammetry theory and practice: matrix algebra, method of least squares, image coordinate refinement, formulation for analytic photogrammetry, intersection, linearization of equations, space resection, two- and three-photo relative orientation, strip adjustment review, block adjustment. Prerequisite: Math 32, Geod 18.

150 Geometric Geodesy (3)
Principles and formulas basic to theoretical and applied geodesy. Primary emphasis on geometric methods. Prerequisite: Math 33.

151 Physical Geodesy (3)
Physical and celestial methods and application of geodesy. Prerequisite: Geod 150.

156 Geodetic Astronomy (3)
Astronomic determination of longitude, time, azimuth, and latitude. Prerequisite: Geod 150.

158 Electronic Surveying and Navigation (3)
An examination of the principles and applications of techniques. Topics include: EM wave propagation, system error identification and analysis, representative surveying systems, baseline radio navigation systems, and long line calculations and transformation techniques. Prerequisite: Math 32; Cart 1.

160 Adjustment Computations I (3)
Basic adjustment theory. Prerequisite: Geod 106, 150; Math 32, 124.

161 Adjustment Computations II (3)
Topics in advanced adjustment theory. Applications to geodesy and photogrammetry. Prerequisite: Geod 160.

165–66 Space Techniques for Geodesy (3)
Determination of the gravitational field, station positions, and fundamental physical constants. Basic celestial mechanics, computing techniques, and data analysis. Modern data acquisition systems. Prerequisite: Math 33, 124; Geod 151.

OCEANOGRAPHY*

11 Navigation (3)
Theory of nevigation, charts, navigation aids, celestial navigation, shipboard instruments. Prerequisite: one course in college algebra and trigonometry; Engl 10.

103–4 General Oceanography (3–3)
Ocea 103: general circulation of the oceans; waves, tides, and prop-

* Courses are offered off campus only.

erties of sea water; history and methods. Ocea 104: topography and sediments of the ocean floor; life in the sea; and interrelationships of the marine sciences. Field trips as arranged. Each course may be taken independently.

105 **Elementary Geophysics** (3)
Gravity, geomagnetism, and seismology in cartography, geodesy, and oceanography. Prerequisite: Math 32; Phys 1 or 3.

GEOLOGY

Professors G. Teleki *(Emeritus)*, G.V. Carroll, F.R. Siegel *(Chairman)*, A.G. Coates, R.C. Lindholm, J.F. Lewis
Adjunct Professors J.W. Pierce, I.G. Sohn, M.A. Buzas, W. Back
Professorial Lecturers N. Hotton, D. Appleman, J.T. Hack, C.B. Cecil
Associate Professor G.C. Stephens
Associate Professorial Lecturers A. Geiger, M.D. Turner, J. Mercer, T.O. Wright
Assistant Professor J.A. Zilczer *(Visiting)*
Assistant Professorial Lecturers F.J. Collier, R.W. Stanton
Lecturer R.T. Rye

Bachelor of Arts or Bachelor of Science with a major in geology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory course—Geol 21–22.
3. Required courses in related areas—(a) Chem 11–12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or Phys 1 or 3 (for the Bachelor of Arts); BiSc 11 *and* Phys 1 or 3 (for the Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 123, 151–52 for both the degree of Bachelor of Arts and Bachelor of Science; Geol 128, 166, 189, 195 for the Bachelor of Science degree only.

Bachelor of Science with a major in geology—engineering option (engineering geology) (departmental)—An interdisciplinary curriculum offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. (Students wishing to work toward the degree of Bachelor of Science [Civil Engineering] with a geology option [geotechnical engineering] should consult the *School of Engineering and Applied Science Bulletin.)* The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory courses—ApSc 57, 58; Chem 13; EE 51; Geol 21–22; Math 31, 32, 33; Phys 14, 15, 16; or equivalents.
3. Required courses in the major—CE 120, 140, 166, 167, 168, 182, 185; Geol 111–12, 117, 118, 122, 175, 189, 195, and one course chosen from Geol 128, 141, or 163; Math 111, 112; ME 126, 131; Stat 91 or 102 or ApSc 115.

Minor in geology—18 semester hours selected with approval of the departmental advisor to undergraduates, including 6 hours of introductory geology (Geol 1–2; 5 and 105; 21–22); two courses selected from Geol 111, 122, 151; and [illegible] from Geol 110, 125, 128, 154, or from requirements of the B.A. and B.S. (For students with special interdisciplinary interests, substitutions can be arranged.)

Master of Science in the field of geology—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree, and the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Master of Sciences degree candidates must include in their program of study Geol 141, 163, 205, and 272. Geol 299–300 *Thesis Research* is required. Candidates must pass a Master's Comprehensive Examination before submitting their thesis work. A reading knowledge examination in an approved foreign language must be passed. With the permission of the department, candidates in the Master of Science program may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Arts in the field of geology—a 33-hour non-thesis option. Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Master of Arts degree candidates must take Geol 128, 141, 163, 175, 189, 205, 219, 266, 272, and 295; two electives must be taken from Geol 216 or 263, 220 or 224, 241 or 243, and 253 or 255. Candidates must pass a Master's Comprehensive Examination. A reading knowledge examination in an approved foreign language must be passed. With permission of the department, candidates may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)—Prerequisite: a Bachelor's degree with a major in geology or in chemistry from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111–12; Geol 141, 241 or 243, 249; Chem 213; and Geol 299–300. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Departments of Geology or Chemistry, must be passed.

Master of Science in the field of engineering geology—An interdisciplinary degree offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science.

Prerequisite: A Bachelor of Science degree in geology or a Bachelor of Science (Civil Engineering) degree from this University or an equivalent degree which must include those courses or their equivalents as outlined for the undergraduate requirements in the field of geology with the engineering option (engineering geology). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis. (Students wishing to work toward a Master of Science in the field of geotechnics and foundation engineering should consult the *School of Engineering and Applied Science Bulletin.*) Each program is arranged to fit the students' needs and interests. Either hydrogeology or engineering geology may be chosen as the field of specialization.

Required: (a) The general requirements stated under the Graduate School of Arts and Sciences; (b) geology—at least 12 semester hours to include Geol 128, 141, 163, and 205; (c) engineering and physical science—at least 12 semester hours, which may include up to 9 semester hours of approved undergraduate civil engineering courses (12 for non-thesis candidates), the remainder to be selected from ApSc 211, 213; CE 204, 205, 206, 207, 208, 209, 214, 216, 219, 255, 256, 257, 265, 271; ME 221, 227, 231, 261, 262; EngS 212, 213,

214, 218, 221, 228, 230, 231, 233, 236. The tool subject requirement is the same as for the Master of Science in the field of geology above.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see Geobiology.

Doctor of Philosophy in the field of geology—Required: the general requirements stated under the Graduate School of Arts and Sciences, including passing a reading knowledge examination in an approved foreign language and one other approved tool subject; and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

Research fields: geomorphology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, structural geology, geochemistry, geophysics, and hydrogeology.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments)—Required: the general requirements stated under the Graduate School of Arts and Sciences, including passing a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

Bachelor of Arts in Education and Human Development with a teaching field in earth science—Prerequisite: the education curriculum; required: the earth science option and the professional courses stated under the School of Education and Human Development.

First Group

1–2 **Introductory Geology for Nonscience Majors** (3–3) Carroll, Stephens, Coates, and Staff
An introduction, for nonscience majors, to the principle features of the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, plate tectonics, origin of life, and evolution. Lecture (2 hours), laboratory (2 hours). Laboratory fee, $22 per semester. (Academic year)

5 **Environmental Geology** (3) Siegel, Lindholm
The relation of people and society to natural environments; population evolution, natural hazards, and mineral resources; economic, legal, and political aspects. Laboratory fee, $20. (Fall and spring)

21–22 **Physical and Evolutionary Geology** (3–3) Lindholm, Lewis
Lecture and laboratory (5 hours). Principles of geology as a base for further study in geology and related sciences. Laboratory fee, $22 per semester. Admission by permission of instructor. (Academic year)

Second Group

101 **History of Geological Sciences** (3) Teleki
Development of scientific thought; history of geological and related sciences. (Spring)

105 **Geological Hazards in Land-Use Planning** (3) Siegel
An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 5 or 21, or permission of instructor. Laboratory fee, $10. (Spring)

110 **Mineralogy and Petrology for Environmental Sciences, Oceanography, and Fields Allied to Geology** (3) Carroll
Lecture and laboratory. Prerequisite: permission of instructor. Laboratory fee, $10. (Spring)

111 Mineralogy (4) Carroll
Lecture and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1 or 21. Laboratory fee, $22. (Spring)

112 Crystal Optics (4) Carroll
Lecture and laboratory. Optical phenomena of crystals and uses of the polarizing microscope. Prerequisite: Geol 111. Laboratory fee, $26. (Fall)

113 Crystallography (3) Appleman
Point-group and space-group theory, fundamentals of crystal structure, x-ray diffraction theory and application. Prerequisite: Math 31. Laboratory fee, $15. (Alternate academic years)

117 Petrology (2) Lewis
Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes; volcanic processes and products. Prerequisite: Geol 21, 111–12; Phys 1 or equivalent; or permission of instructor. (Spring)

118 Petrology Laboratory (2) Lewis
Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111. Laboratory fee, $26. (Spring)

122 Structural Geology (3) Stephens
Study of natural and experimental rock deformation and the relationship between stress and strain as recorded by geologic structures. Prerequisite: Geol 22. (Fall)

123 Structural Geology Laboratory (1) Stephens
Solution of geometrical problems of structural geology. Prerequisite or concurrent registration: Geol 122. Laboratory fee, $10. (Fall)

124 Geologic Map Interpretation (2) Stephens
Interpretation and analysis of geologic maps and cross sections. Laboratory fee, $5. (Spring)

125 Marine Geology (3) Pierce
Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. (Spring)

128 Geomorphology (3) Hack
Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 21. Laboratory fee, $10. (Spring)

132 Economic Geology (3) Turner
Genesis and distribution of mineral raw materials and their uses. Prerequisite: Geol 111. (Fall)

136 Engineering Geology (3) Geiger
For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31; Phys 2 or 4; or permission of instructor. Laboratory fee, $14. (Spring)

141 Introductory Geochemistry (3) Siegel
Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisites or concurrent registration: Geol 117 or equivalent; Chem 11–12; Math 31; Phys 1 or 3; or permission of instructor. Laboratory fee, $12. (Fall)

151–52 Invertebrate Paleontology (3–3) Coates
Biology, taxonomy, functional morphology, and evolutionary patterns of the invertebrate fossil groups, with emphasis on the macro-

invertebrates. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. Laboratory fee, $20 per semester. (Academic year)

154 **Vertebrate Paleontology** (3) Hotton
Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. (Fall, odd years)

158 **Micropaleontology** (3) Staff
Biology, morphology, paleoecology, biogeography, and biostratigraphy of marine and non-marine phosphatic, organic, siliceous, and calcareous microfossils. (Fall, even years)

163 **Sedimentology** (4) Lindholm
Lecture and laboratory, field trips as arranged. Principles of sedimentology, analysis and interpretation of sedimentary processes and environments. Prerequisite: Geol 112; Stat 91; or permission of instructor. Laboratory fee, $22. (Fall)

166 **Principles of Stratigraphy** (3) Coates
Fundamentals of stratigraphic principles and practice. Review of historical concepts, section measuring, vertical and lateral lithostratigraphic relationships, magnetic and climatic stratigraphy, biostratigraphic classification, zonation, correlation, geochronology, facies, and stratigraphic maps. Prerequisite: Geol 151–52 or permission of instructor. (Fall)

168 **Geology of Coal** (3) Stanton, Cecil
Geologic setting, petrography, and physical/chemical characteristics of coal. Prerequisite: Geol 117, 118, and 163. Laboratory fee, $15. (Spring)

175 **Hydrogeology** (3) Back
The occurrence, storage, movement, quality, and problems of pollution of subsurface water, and the hydrologic properties of water-bearing materials. Prerequisite: Geology 111, 122; Math 31; Chem 11-12; or permission of instructor. Laboratory fee (field trips), $8. (Spring)

189 **Geophysics for Geologists** (3) Stephens
Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 21–22; Math 31; Phys 1 or 3; or permission of instructor. (Spring)

195 **Field Work** (2) Staff
Weekend field trips. Surveying, geological mapping, and specific field work methods. Students will be responsible for room and board expenses while at field camp (one week). Laboratory fee (field trip fee), $10. (Spring)

199 **Undergraduate Research or Reading** (arr.) Staff
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

Third Group

205 **Seminar in Geology** (1) Staff
Special topics each semester. May be repeated for credit.

216 **Sedimentary Petrography** (3) Lindholm
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 112, 163; or permission of instructor. Laboratory fee, $22. (Spring)

219 **Petrogenesis I** (3) Lewis
The origin of selected igneous and metamorphic rock types. Laboratory fee, $22. (Fall)

220 Petrogenesis II (3) **Lewis**
Laboratory fee, $22. (Spring)

224 Advanced Structural Geology (3) **Lewis**
Rock deformation. Methods of study and the formation of structurally complex rock. Tectonics. Prerequisite: Geol 122 or permission of instructor. (Fall, odd years)

241 Marine Geochemistry (3) **Siegel**
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, or permission of instructor. Recommended: Chem 22. Laboratory fee, $20. (Spring, even years)

243 Geochemical Prospecting (3) **Siegel**
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geol 141. Laboratory fee, $20. (Spring, odd years)

249 Seminar: Geochemistry (2) **Staff**
Independent topics each semester; may be repeated for credit.

253 Applied Paleontology (3) **Coates and Staff**
Fundamentals of paleoecology using case histories from a wide variety of fossil invertebrate and vertebrate groups. Includes functional morphology of the individual organism, analysis of paleopopulations, paleocommunities and paleobiogeographic provinces and realms. Relationship of faunal and floral paleobiogeographic units to plate tectonics and uses of different fossil groups in tectonics, paleoclimatology, paleobathymetry, paleochronology, and related topics will be discussed. (Fall, odd years)

254 Evolutionary Paleobiology (3) **Coates**
Consideration of modern evolutionary theory with emphasis on the fossil record. (Spring, odd years)

255 Quantitative Paleoecology (3) **Buzas**
Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, size-frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151–52, Stat 91; or permission of instructor. (Fall, odd years)

258 Seminar: Micropaleontology (3) **Staff**
Prerequisite: Geol 158 or permission of instructor. May be repeated for credit. (Fall, even years)

263 Sedimentary Environments (3) **Lindholm**
Study of selected depositional environments. Field trips as arranged. Prerequisite: Geol 163; Stat 91. Laboratory fee (field trips), $20. (Fall, even years)

266 Advanced Stratigraphy (3) **Coates and Staff**
Analysis of special topics in stratigraphy. Historical background, concept of facies, cycles of sedimentation, clastic and carbonate subsurface lithofacies, subsurface biostratigraphy, ecological and evolutionary attributes of stratigraphically useful organisms, quantitative methods, isochronology, geochronology, and magnetic-stratigraphy. (Spring, even years)

272 Regional Geology (2) **Carroll**

275 Geochemistry of Ground Water (3) **Back**
Application of geochemical principles to the interpretation and prediction of groundwater activity in regional systems; carbonate and

silicate equilibrium; weathering and redox reactions; isotopes; and contaminated aquifers. Prerequisite: Geol 175, 141 (may be taken concurrently), or permission of instructor. (Fall—alternate years)

276 **Advanced Groundwater: Modelling** (3) Mercer
Review of basic theory of aquifer systems, analysis of aquifer testing, and numerical methods applied to groundwater problems. Prerequisite: Geol 175 or permission of instructor. A knowledge of FORTRAN is desirable. (Spring—alternate years)

295 **Research** (arr.) Staff
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King, K. Thoenelt *(Chairman)*, C. Steiner
Associate Professorial Lecturer P. Werres
Assistant Professorial Lecturer E.M. Pulgram
Lecturer P. Schwarz

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Ger 1–2, 3–4, 9–10, 51–52; or equivalent.
3. Required courses in other areas—six semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179–80; reasonable proficiency in speaking, reading, and writing German.

Minor in German—Required: 12 semester hours of second-group courses, including Ger 179–80 and one two-semester course in German literature taught in German. Prerequisite: Ger 1–4, 9–10, 51–52, or equivalent.

Bachelor of Arts in Education and Human Development with a teaching field in German—Prerequisite: the education curriculum; required: the German option and the professional courses stated under the School of Education and Human Development.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

GERMAN

First Group

1–2 First-year German (3–3) **Staff**

Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 2: Ger 1. (Fall and spring)

***3–4 Second-year German** (3–3) **Staff**

Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3. (Fall and spring)

***9–10 German Conversation and Composition** (3–3) Steiner

(Academic year)

47 Beginning German for Reading Acquisition (3) Staff

For undergraduates and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

49 German Readings for Nonmajor Students (3) Staff

Primarily for graduate students preparing for reading examinations, undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4 or 47, or equivalent. (Spring)

51–52 Introduction to German Literature—in English (3–3) Thoenelt

Lecture, recitation, and discussion. Selected readings in German literature from the earliest periods to the present. (Academic year)

Second Group

103–4 Major Themes of German Literature—in English (3–3) Thoenelt and Staff

Topics for 1984-85: Ger 103—The Faust myth in Western literature. Faust, or man's pursuit of happiness: its religious, political, and aesthetic possibilities and limitations. Original sin in the Bible; Faust in classical and Germanic mythology; modern Faust-figures in the works of Rousseau, Goethe, Dostoevsky, Stephen Vincent Benét, Paul Valery, Hemingway, Thomas Mann, and Camus. Ger 104—Literature and politics in Germany: *Kultur* and politics, the two faces of Germany. A survey of these two aspects of German history and German life. Selected readings from relevant literary and political documents by Walther v. d. Vogelweide, Kant, W. v. Humboldt, Frederick II, Mme. de Staël, Goethe, Schiller, Marx, Heine, Nietzsche, Thomas Mann, Heinrich Mann, Brecht, and Böll. (Alternate academic years)

111–12 Comparative Studies in Germanic Literatures—in English (3–3) Thoenelt and Staff

Topics for 1983–84: Ger 111—The human condition and four Western ways of life: French moralism, German *Bildung*, Marxism, and Existentialism. Selected readings from Montaigne, Goethe, Schiller, Thomas Mann, Marx, Brecht, Nietzsche, Martin Buber, and Camus. Ger 112—Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. From Plato to the 20th century. Selected works and excerpts from Plato, Aristotle, Horace, Shakespeare, Montaigne, Goethe,

* With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4.

Schiller, Heine, Nietzsche, Thomas Mann, Sartre, Camus, Böll and others. (Alternate academic years)

126 **France and Germany—in English** (3) Thoenelt
Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Summer)

131–32 **18th-Century German Literature—in German** (3–3) Thoenelt
Enlightenment, Storm and Stress, Classicism. Reading, lecture, and discussion. Central topic: *Geist und Tat*—or the 18th-century concept of literature's formative function in society. (Alternate academic years)

141–42 **19th-Century German Literature—in German** (3–3) Steiner
Romanticism, Biedermeier, young Germany, poetic realism. Second age of chivalry and *Sehnsucht*, revolution and counter-revolution in thought and literature. Birth and growth of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture, and discussion. (Alternate academic years)

151–52 **20th-Century German Literature—in German** (3–3) Steiner
The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hesse; émigré literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. (Alternate academic years)

161–62 **Studies in Germanic Languages and Literatures—in English** (3–3) King
Topic for 1983-84: Germanic mythology. Introduction to the pre-Christian religion of the Germanic peoples and to a multidisciplinary study of mythology.

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt
Discussions and compositions on literary and cultural topics, readings of newspaper articles, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammar and style studies. (Alternate academic years)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300–1800)
Same as Engl/Fren/Hist/Phil/Rel 183 and Art 187.

SANSKRIT

105–6 **First-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Alternate academic years)

107–8 **Second-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural-oral practice in language laboratory. Prerequisite: Ger 105–6 or equivalent. Laboratory fee, $17.50 per semester. (Alternate academic years)

GERONTOLOGY—GRADUATE PROGRAM

Professors R.G. Brown *(Academic Director)*, R.A. Kenney
Professorial Lecturer M. Sicker
Associate Professorial Lecturers M.H. Morrison, W. Scanlon

Committee on Gerontology
R.G. Brown *(Academic Director)*, J.C. Heddesheimer, R.A. Kenney, S.D. Lind

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in gerontology, directed by the Committee on Gerontology and drawing upon faculty from various departments within the University and resource persons in the community.

The Gerontology Program derives its theoretical perspectives and substantive knowledge from several disciplines to provide a balanced study of the processes of aging, and societal reactions and responses to the aged and their problems, with the objective of preparing persons for positions which involve the planning, development, and evaluation of programs serving older persons. Each student will work closely with an advisor to design a program of studies appropriate to individual interests and professional objectives. Every student will have field experience in an agency involved in the planning and evaluation of services for the elderly. Prospective candidates should consult with the director of the Gerontology Program.

Master of Arts in the field of public policy with a concentration in gerontology—Prerequisite: a bachelor's degree with a *B* average (or equivalent) from an accredited college or university. In some cases, the applicant may be requested to take the Graduate Record Examination. Previous experience in gerontology is not essential; a variety of academic and experiential backgrounds are acceptable.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 42 semester hours of course work. There is no thesis requirement. Core courses required for all students: Econ 217; PSc 203; Stat 104, 183 (Stat 107 or Psyc 244 may be substituted for the latter); Gern 201, 205, 290; Soc 254, 280; Educ 344; and HSA 235. The remaining three courses are electives. All students are required to pass a Master's Comprehensive Examination.

201 **The Biology of Aging** (3) Kenney
The processes of aging in the various systems of the human body; principal illness patterns in the elderly; theories of the aging process. (Spring)

205 **Public Policy and Aging** (3) Scanlon, Sicker
The "political economy" of aging in our society. Political and governmental processes as they influence and are influenced by older persons; the impact of demographic trends and retirement patterns on the economic system. (Fall)

290 **Practicum in Gerontology** (3) Morrison
Field experience in an agency involved in the planning and evaluation of services for the elderly.

GREEK

See Classics.

HEALTH SERVICES ADMINISTRATION

Professors L. Gintzig, M.C. Devolites *(Emeritus)*, K.J. Darr, P.N. Reeves, P.S. Birnbaum, R.G. Shouldice, J. Ott, R.F. Southby *(Chairman)*
Professorial Lecturers H.L. Hirsh, H.R. Wertlieb
Associate Professors L.G. Pawlson, S.D. Lind, W. Greenberg, D.L. Zalkind, G.E. Crum
Adjunct Associate Professors J.L. Ryan, J.C. Wilmot
Associate Professorial Lecturers C.V. Gordon, N.B. Hadley
Assistant Professorial Lecturers M.G. Bromley, M.M. Barch, D.P. Andrulis, S.B. Cohen, M.E. Samuels, D.F. Eversmann, P.L. Knight, D. Metz, D.J. Moon
Lecturers J.E. Clair, J.D. Bobula, C.F. Row

See the School of Government and Business Administration for programs of study leading to the degrees of Master of Health Services Administration* and Post-Master's Graduate Certificate in Health Services Administration, and areas of concentration in health services administration in programs leading to the degrees of Doctor of Business Administration and Doctor of Public Administration.

Second Group

142 **Financial Management in Health Care Institutions** (3) Eversmann
Consideration of the nature, analysis and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process. (Spring)

153 **Survey of Health Care Organization** (3) Clair
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall)

154 **Introduction to Hospital Management and Procedures** (3) Knight
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager. Prerequisite: HSA 153 or consent of instructor. (Spring)

170 **Quantitative Methods in Health Care Administration** (3) Gordon
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas. (Fall)

190 **Special Topics in Health Care Administration** (3)
Experimental offering at the undergraduate level. (Fall and spring)

Third Group

202 **Introduction to Health and Medical Care** (3) McKelvey, Samuels, Pawlson
Lecture and discussion (2 hours), laboratory (2 hours). Examination of the nature of health and disease using biomedical, epidemiological,

* Accredited by the Accrediting Commission on Education for Health Services Administration.

and ecological models. Description and analysis of resource, process, and control components involved in delivering services—technology, manpower, patients, delivery mechanisms, and assessment and allocative mechanisms. Survey of selected disease problems and their impact on management and planning. Medical terminology. (Fall and spring)

203 **Organization and Management of Health Services** (3) Shouldice, Hadley, Row

Application of management theory and concepts to health services systems and institutions. Characteristics, functions, and organizational structures of delivery systems. (Fall and spring)

207 **Program Evaluation in Health Services** (3) Lind, Zalkind

Basic investigatory techniques used to conduct, as well as to assess and interpret, evaluation of health services programs. Includes information systems and data collection, analyses, and reporting. Introduction to computer applications. (Fall and spring)

208 **Quantitative Methods in Health Services Operations** (3) Zalkind, Cohen

Concepts and application of quantitative methods in health services operations, involving biostatistics, demand analysis and forecasting, resource allocation, and quality and productivity control. (Fall and spring)

209 **Health Resources Management I** (3) Devolites, Greenberg

Introduction to health resource management and funds administration for health services institutions and agencies. Preparation of budgets, financial statements, and reports. Financial analysis. Management of plant and equipment. Regulation and containment of costs. Safeguarding assets. (Fall and spring)

210 **Health Resources Management II** (3) Bobula, Greenberg

Review of micro- and macroeconomic principles as they apply to health services programs. National health expenditures. Study of development, allocation, and utilization of health manpower. (Fall and spring)

212 **Introduction to Health Services Planning** (3) Reeves, McKelvey, Crum

History and development of health services planning in the United States. The generic planning process and basic health services planning methods and procedures useful in project planning. Introduction to strategic planning and marketing concepts relevant to health services planning (e.g., service area determination). (Fall and spring)

215 **Health Services and the Law** (3) Hirsh

The sources of law and the legal processes affecting the health services system. Elements of administrative law and agency processes. Introduction to the legal relationships, e.g., torts, contracts, and insurance, of facilities, physicians, personnel, and patients. Legal aspects of labor relations, and trends in health services delivery law. (Fall and spring)

221 **Health Systems Strategic Planning** (3) Reeves

Applications of advanced quantitative and analytic methodologies in planning health services systems (e.g., priority determination, health status indicators and indexes, models, interaction analyses). Focus on a sequence of critical components of the strategic planning process for both institutional and community systems. (Fall)

223 **Policy in Strategic Health Services Planning** (3) Reeves

Effects of legal, political, social, and economic factors in strategic

health planning. Emphasis on formulation, analysis, and implementation of local and institutional health policies. The role of these policies as expressions of values which serve as guiding forces in the strategic planning process. (Spring)

225 **Developing National Health Services Policy** (3) Darr
Understanding and analyzing the processes by which health services policy is formulated and implemented at the federal level. Focus on Congress, the presidency, and the agencies. (Fall)

227 **Seminar: Ethics in Health Services Administration** (3) Darr
Investigating moral and ethical problems confronting the health services system. Understanding the legal, social, and policy implications of issues in medical and health services delivery such as: administrative and institutional ethics, professional codes, impaired professionals, death, fertility control, experimentation and new technology, and resource allocation. (Spring)

231 **Managing the Short-Term Hospital** (3) Darr, Metz
Lecture and discussion (2 hours), laboratory (2 hours). Organization, management, and interrelationships of hospital clinical, support, and administrative departments. Analyses of procedures and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HSA 203 and Mgt 210, or permission of instructor. (Fall and spring)

233 **Delivery of Mental Health Services** (3) Andrulis
Study of the organizations and systems for delivery of mental health services; emphasis on management and financing treatment and rehabilitation facilities. (Fall and spring)

235 **Human Services Integration** (3) Reeves
Introduction to the concept of a human services system. Description and analysis of current human services programs as components of such a system and of the roles of the public and private sectors in providing these services. Discussion of interorganizational theory as a basis for understanding current system configurations and for developing improved service delivery systems. (Spring)

236 **Introduction to Long-Term Care Administration** (3) Lind, Wertlieb
Evolution of long-term care as a health care delivery subsystem. Comparative evaluation of characteristics of various types of institutions and programs. Government regulation. Relationships between the purposes and functions of these institutions and programs and the health care needs of the community are investigated. (Fall)

237 **Managing the Long-Term Care Institution** (3) Wertlieb, Lind
Organization and management of nursing homes, personal and residential care facilities, and institutions for other populations needing long-term specialty treatment. Emphasis on personal and professional skills necessary to provide a wide range of services and quality care in these environments. (Fall and spring)

238 **Ambulatory Health Services Management** (3) Shouldice
Introduction to the organization and management of ambulatory care. Presentation of models, financing mechanisms, institutional affiliations, estimating and planning for ambulatory care, and the use of solo and group practice of medicine as part of a total system of services delivery. (Fall)

239 **Management of Health Maintenance Organizations** (3) Shouldice, Ott
Basic principles and fundamentals of prepaid group practice and

health maintenance organizations. Emphasis on planning, development, and operation of HMOs, including discussion of models, financial issues, consumers, and providers of care. (Spring)

245 **Case Studies in Health Services Administration** (3) Birnbaum, Southby, McKelvey, Gintzig

Intensive qualitative and quantitative analyses of major problem areas in health system administration and planning using the case study method. Cases cover the broad spectrum of health policy, planning, and management of the health services system. Serves as a capstone course for health services students. (Fall and spring)

252 **Comparative Health Services Systems** (3) Gintzig, Southby

Evaluations of various organizational patterns, functions, and trends in international health services delivery systems. Emphasis on sources of such differences and significance of the systems to the health status of a nation. Primarily for advanced students, open to others by arrangement. (Spring)

255 **Issues in Gerontology** (3) Lind

Interdisciplinary seminar on the nature and problems of aging, including social, psychological, biological, economic, demographic, health, and service needs of the older population. Introduces theory and research, and explores attitudinal and behavioral components based on contact with older persons. Discussion of reactions to aging. (Fall)

257 **Advanced Health Resources Management** (3) Bromley

Development of financial health policies, objectives, and programs. Financial management of multi-unit health care systems; financial aspects of national health programs, prospective rates, and regulation of health prices; case studies and field research. (Fall and spring)

270 **Research in Health Services Administration** (3) Southby

Field research. Primarily for advanced students; open to others with consent of instructor. May be repeated for credit. (Fall and spring)

271 **Field Problem Studies in Health Services Administration** (3) Crum

Work experience guided by a qualified preceptor on selected management and planning issues and problems occurring in health services facilities, programs, and agencies. Primarily for advanced master's and doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring)

273–74–75 **Residency I** (3–3–3) Staff

Twelve-month residency. Work experience guided by a qualified preceptor; periodic written progress reports and a written major report or selected field projects are required. (Fall and spring)

276–77–78 **Residency II** (3–3–3) Staff

For students who take additional residency experience. (Fall or spring)

285–86 **Readings in Health Services Administration** (3–3) Southby and Staff

Supervised readings in special areas of health services management and in policy and planning. Primarily for advanced students; open to others by arrangement. May be repeated for credit. (Fall and spring)

290 **Special Topics in Health Services Administration** (3) Hirsh

Experimental offering; new course topics and teaching methods. May be repeated for credit. (Fall or spring)

299–300 **Thesis Research** (3–3) Southby
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to the other graduate students at the discretion of the Department.

310 **Health Resources Allocation Policies** (3) Southby
Study of major contemporary issues in health resources allocations. Development and critique of policies designed to deal with these issues. (Fall)

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

330 **Health Services Delivery Policy** (3) Lind
Study of major contemporary issues in health services delivery. Development and critique of policies designed to deal with those issues. (Spring)

398 **Advanced Reading and Research** (arr.) Southby
Limited to doctoral students preparing for the general examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Southby
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

HEBREW

See Classics.

HISTORY

Professors R.H. Davison, R.C. Haskett, R.P. Sharkey, H.M. Sachar, R.W. Kenny *(Chairman)*, P.P. Hill, L.G. DePauw, R. Thornton, L.G. Schwoerer, P.F. Klarén, R.E. Kennedy, Jr., W.H. Becker
Adjunct Professor R.P. Multhauf
Professorial Lecturers S. Shaloff, D.C. Allard, M. Blumenson
Associate Professors C.J. Herber, W.R. Johnson, R.A. Hadley, A.D. Andrews, J.O. Horton, L.P. Ribuffo, E. Berkowitz, M.A. Atkin
Associate Professorial Lecturers L.J. Lear, A.L.K. Nelson, L.W. Banner
Adjunct Assistant Professor S.R. Crew

Bachelor of Arts with a major in history (field-of-study or departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Required introductory courses—Hist 39–40, 71–72, or equivalent. Majors may waive one or more of the prerequisite courses by passing departmental examinations, by attaining scores of 600 or above on the College Entrance Examination Board Achievement Tests, or by good performance on Advanced

Placement Examinations. Credit for one or more of the prerequisite courses may be received by superior performance on departmental or Advanced Placement Tests. The Department does not accord either waiver or credit by CLEP examination.

3. Required courses in related areas—(a) either 12 semester hours of an approved foreign language or (b) nine semester hours in statistics (Stat 53, 105, and 107).

4. (a) *Field-of-study major*—Hist 199 (Proseminar), six semester hours of third-group courses, including at least three semester hours of research seminar, and the passing of the major examination in the senior year. In planning a program, the student, under the guidance of an advisor, should choose courses which will provide a broad understanding of diverse chronological and geographical aspects of the human experience.

(b) *Departmental major*—27 or more hours of second- and third-group courses, including Hist 199, six semester hours of third-group courses, including at least one research seminar, and six semester hours chosen from each of the following fields: (A) Europe—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 136, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 157, 158, 183, 198; (B) United States—Hist 117, 118, 126, 128, 129, 133, 134, 137, 138, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 184, 185, 186, 197, 198; (C) Russia, Asia, Africa and Latin America—Hist 107, 108, 116, 119, 120, 135, 145, 146, 158, 161, 162, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196, 198.

Courses numbered 198 and courses in the 700 Series may also satisfy one of the three Field requirements. Departmental majors should inquire of the department chairman or major advisor as to the specific applicability of these courses.

A pamphlet relating to the major is available in the offices of the dean of the Columbian College of Arts and Sciences and in the History Department.

An Honors Program may be chosen by juniors with satisfactory scholastic records. Application to this program must be made before the beginning of the second semester of the junior year. Students accepted into the program take a three-hour seminar in the second semester of the junior year and complete the research requirements for the history major by preparing the Senior Honors Thesis (Hist 191–92) in the final year of undergraduate study.

Minor in history—Undergraduate students who select a minor in history must ordinarily declare their intention to the departmental advisor no later than the beginning of their senior year. Such students may choose a non-specialized history curriculum, or may concentrate in one area such as ancient history, medieval history, early modern Europe, modern Europe, the Near East, Russia and East Europe, the United States, Latin America, or the Far East, or in one field such as economic, social, intellectual, diplomatic, political, black, or women's history. In each case the program of courses will be planned in consultation with the history advisor. To meet the departmental requirements for a minor, the student must complete at least 15 semester hours in approved courses with a grade of C or above. One 3-semester-hour seminar must be included in the program.

Master of Arts in the field of history—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination with the Advanced Test in History and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of (1) a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300 *Thesis Research*, or (2) a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (six semester hours). Hist 201 is required of candidates who have not previously had a course in historiography and historical method. At least six semester hours of each candidate's program must be in third- or fourth-group history courses; a maximum of six may be in approved courses outside the History Department. To receive graduate credit for second-group courses, master's candidates must arrange for extra work with the instructors. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

Master of Arts in the field of history with a concentration in historic preservation—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour master's degree program combines courses in United States history and historic preservation. It includes at least 18 hours of U.S. social history, U.S. urban history, man-made America, and the seminar sequence in historic preservation. For other course distribution requirements, see the departmental graduate advisor. Candidates in this program may satisfy the tool requirement by passing an examination in measured architectural drawing.

Master of Arts in the field of history with a concentration in public policy—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour program emphasizes the study of history as it relates to the analysis and conduct of public policy. History 213–14 and internship required. Additional course work to be chosen with advisor's approval.

Doctor of Philosophy in the field of history—Required: the general requirements stated under the Graduate School of Arts and Sciences, including the passing of a written examination in two appropriate foreign languages, or one foreign language and an approved tool subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. The major fields include the following: ancient history, medieval Europe, early modern Europe, modern Europe, United States, Latin America, modern Near East, modern Far East, Russia and East Europe. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, historic preservation, etc.) to the chronologically limited fields (e.g., American colonial history, Tudor and Stuart England, etc.). A student may elect one special field outside of the History Department if it is relevant to the program. Students having a special field in historic preservation may satisfy one tool requirement by passing an examination in measured architectural drawing.

Bachelor of Arts in Education and Human Development with a teaching field in history—Prerequisite: the education curriculum; required: the history option and the professional courses stated under the School of Education and Human Development.

Course Accessibility: All second-group courses are open to students without history course prerequisites with the exception of Hist 157 and 199.

First Group

39–40 European Civilization in Its World Context (3–3) **Staff**
Hist 39: Introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: from 1715 to the present. **(Academic year)**

50 **Washington, D.C.: Culture and Politics** (3) Gillette and Interdisciplinary Team
(Formerly Hum 40)
Same as AmCv/PSc 50.

71–72 **Introduction to American History** (3–3) **Staff**
Hist 71: political, social, economic, and cultural forces of the United States, in world perspective, from the earliest settlements to 1876. Hist 72: from 1876 to present. (Academic year)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **The European Revolutionary Tradition, 1640-1917** (3) Kennedy
A comparative study of the English, French, and Russian revolutions with focus on theories of revolution, revolutionary ideology, millenarianism, and the revolutionary legacy inherited by third-world movements. (Fall)

105–6 **History of Science** (3–3) Multhauf
Hist 105: from ancient natural philosophy through the 17th-century scientific revolution. Hist 106: from the Industrial Revolution to the 20th-century amalgamation of science and technology. (Academic year)

107 **The Ancient Near East and Egypt to 322 B.C.** (3) Hadley
Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

108 **Greece and the Near East, 359 B.C. to the Second Century A.D.** (3) Hadley
Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.

109 **Early Aegean and Greek Civilizations to 338 B.C.** (3) Hadley
Neolithic background: Bronze age—Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest. (Fall)

110 **The Roman World to 337 A.D.** (3) Hadley
Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 **Medieval History** (3–3) Andrews
Hist 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D.; Byzantium and Islam at their apogee. Hist 112: Medieval European daily life, institutions, and creative movements to about 1400; the Crusades and the Near East to the rise of the Ottoman Turks. (Academic year)

116 **History of Africa** (3) Shaloff
Survey of political, cultural, and economic development from ancient times to the present. (Spring)

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* An interdepartmental course offered by the History, East Asian Languages and Literatures, Economics, Geography and Regional Science, Philosophy, Political Science, and Religion Departments.

117 **Crisis or Conspiracy? A History of the International Politics of Oil** (3) Becker
The history of the international politics of oil, with special attention to developing relationships between major oil companies and governments here and abroad. (Summer)

118 **Business and American Life** (3) Becker
The historical interaction of business with other American institutions: religion, the family, law, education, government, labor unions, etc. (Summer)

119 **China in the 20th Century: Reform and Revolution** (3) Johnson
Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

120 **The Medieval Near East** (3) Andrews
Byzantium and the Islamic World. The Crusades and their consequences. The Mongols, Ottoman Turks, and their neighbors of the 17th century: Eastern and Western perspectives. (Spring)

121 **The Renaissance in Western Europe** (3) Schwoerer
Study of the economic, political, intellectual, and cultural acceleration in Western Europe, beginning in the Italian city-states and spreading to France, Germany, and England, in the 14th through 16th centuries. (Fall)

122 **The Reformation in Western Europe** (3) Herber
Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

123 **European Intellectual History I** (3) Kennedy
Popular culture; religion and science in the 17th century; the Enlightenment; Voltaire, Hume, Rousseau, Montesquieu, Beccaria, Diderot, Condorcet on religion, history, nature, society, and politics; the intellectural origins of the French Revolution. (Fall, even years)

124 **European Intellectual History II** (3) Kennedy
Intellectual responses to the French Revolution; 19th-century historical approaches to society, religion, economics, biology, ethics, and psycholanalysis: Hegel, Comte, Marx, Darwin, Nietzsche, and Freud; the intellectual origins of Nazism; literary, artistic, and philosophical responses to World War I. (Spring, odd years)

125 **Women in European History** (3) Schwoerer
A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)

126 **Government Regulation and the American Experience** (3) Becker
The historical evolution of the ideas, policies, and consequences of government regulation of business in the United States. (Fall)

127 **Theories of History** (3) Lavine
Same as Phil 127.

128–29 **War and Society** (3–3) Staff
How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil-military relations, the development of strategic thought, and to the naval and military influence Britain and America have exerted on each other. Hist 128: from 1776 to 1918. Hist 129: 1919 to the present. (Academic year)

131–32 **History of Germany** (3–3) Herber
Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist 132: from William II to the present. (Academic year)

133 **Recent U.S. History, 1890-1941** (3) Ribuffo
Political, social, diplomatic, and intellectual developments, with particular emphasis on the "searching" 20's and New Deal. (Fall)

134 **Contemporary U.S. History Since 1941** (3) Ribuffo
Political, social, diplomatic, and intellectual developments, with particular emphasis on the Cold War, "silent" 50's, and disrupted 60's. (Spring)

135 **History of Soviet Intelligence Services** (3) Dziak
The role and impact of intelligence and security operations in Soviet domestic and foreign policy, 1917 to the present. The course examines the literature and problems of Soviet intelligence operations; Tsarist antecedents; Lenin, the Cheka, and the formative years; operations under Stalin; problems of the post-Stalin years; and operations in the Brezhnev era. Prerequisite: 3 credit hours from among Hist 146, PSc 131 or 168, or permission of instructor.

136 **Europe in the 20th Century** (3) Sachar
Diplomatic, political, and cultural developments from the turn of the century to the present. (Summer)

137 **U.S.-Soviet Strategic Relations Since World War II** (3) Thornton
Survey of U.S.-Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)

138 **American Foreign Economic Policy in Historical Perspective** (3) Becker
Historical evolution of United States international economic relations, major issues of foreign economic policy, political problems in policy-making. Emphasis on period since 1945. (Spring)

139–40 **World History in the 20th Century** (3–3) Sachar
Diplomatic, political, and cultural factors. Hist 139: from the turn of the century to the Munich settlement of 1938. Hist 140: from the Munich settlement to the present. (Academic year)

141 **History of France I** (3) Kennedy
Old Regime: Louis XIV, demography, peasants, bourgeois, nobles; Church-Protestant-Jewish relations; salons, Enlightenment and *philosophes;* literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)

142 **History of France II** (3) Kennedy
The Revolutionary tradition, and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; dechristianization, Catholic integralism and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)

145 **Russia to 1801** (3) Atkin
Survey of Russian history from the rise of the Kievan confederation in the ninth century to the establishment of Imperial Russia as a European great power. Attention will be given to the political, socio-economic, and cultural history of the East Slavs, especially the Russians. (Fall)

146 **Russia and the Soviet Union from 1801 to the Contemporary Era** (3) Atkin
Survey of Russian and Soviet history from the reign of Alexander I to the post-Stalin era. Attention will be given to the contending forces of revolution, reform, and conservatism; diplomatic relations; economic development; social change; and Russian culture. (Spring)

147 **Economic History of Modern Europe** (3) Sharkey
Joint offering of the History and Economics Departments. Economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 **The French Revolution** (3) Kennedy
Social, political, economic, and cultural history of the decade of revolution, 1789-1799. Attention to its structural consequences in France and in Europe-at-large. (Summer)

149–50 **European Diplomatic History** (3–3) Davison
Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 **History of England** (3–3) Kenny
Development of English civilization and its impact on Western culture. Hist 151: to 1689. Hist 152: since 1689. (Academic year)

153 **Tudor England** (3) Kenny
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485-1603. (Fall)

154 **Stuart England** (3) Schwoerer
Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, socioeconomic, and intellectual developments in England, 1603–1714. (Spring)

155 **History of Modern Ireland** (3) Kenny
The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923.

157 **20th-Century European Diplomatic History** (3) Sachar
The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 **Modern Jewish History** (3) Sachar
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Spring)

161 **Revolution in 20th-Century Latin America** (3) Klarén
Examination of the major social revolutions in modern Latin America, especially in Mexico (1910), Bolivia (1952), Cuba (1959), and Chile (1970); their origins, social composition, leadership, and ideology. (Spring, even years)

162 **20th-Century Latin America** (3) Klarén
A survey of the main societal trends shaping Latin America in this century, with particular emphasis on such themes as populism, urbanization, reformism, modernization, Peronism, nationalism, Communism, Castroism, the military, and the development process. (Spring)

163–64 **History of Latin America** (3–3) Klarén
Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: a problems approach to Latin America, 1820 to the present; thematic emphasis on neo-colonialism, corporatism, liberalism, *caudillismo*, modernization, populism, and revolution. (Academic year)

165 **Latin America and the Industrializing World, 1850–present** (3) Klarén
Examination of the political/diplomatic responses of Latin American nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries. (Fall)

166 **History of Mexico** (3) **Klarén**
Focus on Aztec imperialism, the Indian view of the Conquest, landlord/peasant relations, the struggle for independence, the Revolution of 1910; race, caste and class in modern Mexico; the role of the modern Mexican state. (Fall, odd years)

167 **Man-Made America: The Old Colonial Scene** (3) Haskett
An interpretive tour through the early American landscape, 1607–1750. Heavily illustrated with color slides. Same as AmCv 167. (Fall)

168 **Man-Made America: Views of a New Nation** (3) Haskett
An interpretive tour through the early American landscape, 1750–1820. Heavily illustrated with color slides. Same as AmCv 168. (Spring)

169 **The American Revolution** (3) **DePauw**
The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Spring)

170 **U.S. Early National History** (3) **Hill**
Political, diplomatic, economic, and social history of the early republic, 1789–1828. (Fall)

171–72 **U.S. Social History** (3–3) Horton
Hist 171: daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607–1861. Hist 172: the urban-industrial era from 1861 to present.

173 **Afro-American History** (3) **Horton**
Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as AmCv 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton
Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as AmCv 174. (Spring)

175–76 **U.S. Political History** (3–3) **Haskett**
A study of power: who gets what, where, when, and how. Hist 175, 1763–1865; Hist 176, 1865–1960. (Academic year)

177 **The Ante-bellum South** (3) **DePauw**
Investigation of political, economic, intellectual, social, and cultural characteristics of the American South prior to 1860. Special attention to myths associated with the South, ideologies supporting the slave system, and cultural practices among the white, black, and Indian populations. (Fall, alternate years)

178 **Making and Braking the Welfare State** (3) Berkowitz
An examination of America's changing approaches to health and welfare problems, explaining the origins of modern entitlement programs and examining ways in which these programs have been adapted and reshaped. Topics such as welfare reform and health insurance are covered. (Spring)

179–80 **U.S. Economic History** (3–3) Sharkey
Joint offering of the History and Economics Departments. Economic growth from colonial times to the present. Development of various

sectors in the economy and their interdependence. Hist 179: 1607–1865. Hist 180: from 1865 to the present. (Academic year)

181–82 **U.S. Diplomatic History** (3–3) Hill
American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300–1800)
An interdisciplinary examination of the rise of Western individualism from the Renaissance to the American and French Revolutions. Analysis of the tension between reason and religious and popular traditions. Guest lectures by Art, English, Germanic Languages and Literatures, and History faculty. Core course for Early Modern European Studies major, but open to other undergraduate and graduate students as well. Same as Engl/Fren/Ger/Phil/Rel 183 and Art 187. (Spring)

184 **Civil War and Reconstruction** (3) Horton
How the Union and Confederacy organized for war, evolved strategies, and searched for commanders who could win battles and how the war affected ordinary soldiers and citizens. Political, economic, and social consequences of the Civil War. (Spring)

185 **History of Women in America** (3) DePauw
Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. Same as AmCv 185. (Fall)

186 **U.S. Urban History** (3) Gillette
The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)

187 **History of Modern China** (3) Johnson
China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) Thornton
Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)

189 **History of Modern Japan** (3) Sigur
Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

190 **Ethnohistory** (3) Wagner, Humphrey
Same as Anth 190.

191–92 **Senior Honors Thesis** (3–3) Herber
Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) Davison
Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)

194 **History of the Modern Near East** (3) Davison, Sachar
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and

institutions; great-power imperialism; crises of Turkish Straits, Suez, Arab-Israeli relations; and other issues. (Fall, odd years)

195 **Traditional Civilizations of China and Japan** (3) Johnson
Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1800. (Fall)

196 **The Modern Transformation of China and Japan** (3) Johnson
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)

197 **Oral History and Interview Techniques** (3) Staff
Same as AmCv 197.

198 **Special Topics in History** (3) Staff
Historical perspectives on great issues of past and present. New topic each semester.

199 **Proseminar: Readings for the History Major** (3) Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

Third Group

Any student who has had the appropriate preparation may, with the consent of the instructor, enroll in a third-group course. Enrollment is not restricted to history majors and graduate students. History majors will satisfy the third-group requirement by taking either two courses for research or one course for research and one course for a readings program.

201 **History and Historians** (3) Staff
Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)

203–4 **Seminar: Research or Readings** (3–3) Staff
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 **Readings Seminar: Evolution of Nationalism in Eastern Europe** (3) Staff
Formation of national consciousness and emergence of modern East European states after World War I. Developments of the interwar period. Open to qualified undergraduate seniors. (Fall)

206 **Readings Seminar: Revolution in Eastern Europe** (3) Staff
Transformations of East European states during World War II. Resistance movements, communization, and national self-assertion in the immediate post-Stalin period. Open to qualified undergraduate seniors. (Spring)

209 **Readings/Research Seminar: Topics in Ancient History** (3) Hadley
Readings on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211 **Readings/Research Seminar: Medieval History** (3) Andrews
Prerequisite: Hist 111–12 or equivalent. Students with working knowledge of Latin may receive research credit. Focus on a particular area and period, with emphasis on interdisciplinary research techniques.

213–14 **History in Public Policy** (3–3) Berkowitz
Seminar in the use of historical insights and methods in policy-

making, with emphasis on domestic issues. Assessment and use of primary sources for policy analysis and the use of historical analogy in policy formulation.

215 **Readings Seminar: Communist Monolith That Never Was** (3) Staff
Soviet relations with East European and Asian socialist states from the end of World War II to the Sino-Soviet split. Changes in substance and form in relations among ruling Communist parties. Open to qualified undergraduate seniors. (Spring and summer)

217 **Readings/Research Seminar: Russian and Soviet Thought** (3) Atkin
Selected topics in the intellectual, social, and cultural history of 19th- and 20th-century Russia and Soviet Union.

219 **Internship in History and Public Policy** (3) Berkowitz
Supervised participation in an office or agency concerned with the formulation of public policy; terms of the internship are arranged with the Director of the History and Public Policy program. Enrollment restricted to students in the History and Public Policy program. (Fall and spring)

220 **American Business History** (3) Becker
A readings or research seminar devoted to the historical development of American business institutions in manufacturing, distribution, transportation, and finance. These business institutions will also be considered in the context of America's legal system, governmental organization, and social institutions. (Fall)

221 **Comparative Business History** (3) Becker
A readings or research seminar on the history of business institutions in manufacturing, distribution, transportation and finance in England, Germany, France, and Japan. The course will be primarily devoted to the period since industrialization, studying business institutions in their economic, legal, governmental, and social contexts. (Spring)

222 **History of U.S. Government Regulation, 1886 to the Present** (3) Becker
An overview of the political history of regulation beginning with the legislation creating the Interstate Commerce Commission in 1886. Offered off campus.

224 **Readings/Research Seminar: European Intellectual History** (3) Kennedy
Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life.

225 **History of Washington, D.C.** (3) Gillette
Same as AmCv 225.

228 **Readings/Research Seminar: Modern Military and Naval History** (3) Staff
Discussion, readings, and research in 20th-century European and American military and naval history. (Fall)

229 **Seminar: World War II** (3) Blumenson
Examination of statecraft and the management of force before, during, and after World War II. Special attention to broad aspects of military policy and strategy and their interaction with international politics and diplomacy. (Spring)

230–31 **Readings/Research Seminar: Strategy and Policy** (3–3) Staff
Hist 230: A study of the historical development of strategy, and the

relationship of military thought to national policy. Hist 231: 20th-century strategic thought. (Academic year)

232 **Comparative Communist Systems I** (3) Wolchik
Same as PSc 232.

233 **Comparative Communist Systems II** (3) Wolchik
Same as PSc 233.

234 **Modern Archives Administration** (3) Daniels*
Open to history graduate students and undergraduate majors. Lectures and discussion on all phases of administering archival materials. Classes at National Archives. Students must enroll before September 1 for October session, before April 1 for June session.

237 **Readings Seminar: Soviet Foreign Policy, 1917-1964** (3) Petrov
Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful co-existence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239 **Readings/Research Seminar: Early Modern European History** (3) Schwoerer
Topics selected from Western European history of the 14th through 17th centuries. Readings or research depending upon students' interests and curricular needs.

241 **Readings/Research Seminar: Modern European History** (3) Herber
Prerequisite: appropriate preparation and consent of instructor.

246 **Readings/Research Seminar: History of Modern Russia and Soviet Union** (3) Atkin
Selected topics in the domestic history of modern Russia and Soviet Union. Readings or research depending upon students' interests and curricular needs. (Fall)

247 **Readings/Research Seminar: The Theory and Practice of Modern Imperialism** (3) Sharkey
Critical analysis of Marxist and non-Marxist theories of modern imperialism in the light of late 19th and 20th century European and American experiences in Asia, Africa, and Latin America. (Fall)

248 **Readings Seminar: Modern European and Near Eastern History** (3) Davison
Admission by permission of instructor. (Spring)

249 **Research Seminar: European Diplomatic History** (3) Davison
Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th centuries. Reading knowledge of one language other than English required. (Fall)

251 **Readings/Research Seminar: English People and Institutions** (3) Kenny, Schwoerer
Selected topics in the political, social, intellectual, and economic history of England. Focus upon one time period and special area of interest.

253–54 **Readings Seminar: History of Sino-Soviet Relations** (3–3) Thornton
Seminar designed to develop analytic and historiographic skills. Fall: turn of the century to 1949; spring: Korean War to the present. (Alternate academic years)

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* Maygene Daniels is Director of the Modern Archives Institute.

255–56 **Readings Seminar: U.S.-Soviet Strategic Relations Since World War II** (3–3) Thornton
Seminar designed to develop a conceptual framework for understanding contemporary U.S.-Soviet relations. Fall: World War II to 1965; spring: 1965 to the present. (Academic year)

258 **Communist Party of the Soviet Union** (3) Sodaro
Same as PSc 258.

261 **Readings Seminar: Topics in 20th-Century Latin America** (3) Klarén
Admission by permission of the instructor. (Fall)

262 **Research Seminar: Agrarian Society and Economic Change in Modern Latin America** (3) Klarén
Research on the impact of modernity (e.g., foreign capital, immigration, internal migrations, capitalism, imperialism) on traditional rural society. Admission by permission of instructor. (Spring)

271–72 **U.S. Social History** (3–3) Horton
Hist 271: Readings seminar on American daily life, institutions, and intellectual and artistic achievements. Hist 272: Research seminar.

275–76 **Readings/Research Seminar: U.S. Political and Colonial History** (3–3) Haskett
Research or readings, depending on students' interest and curricular needs. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor.

277–78 **Historic Preservation** (3–3) Staff
Same as AmCv/U&RP 277–78.

279 **Readings/Research Seminar: American History** (3) Hill
Readings or research, depending on students' interests and curricular needs. Admission by permission of instructor. (Summer)

281–82 **Readings/Research Seminar: U.S. Diplomatic History** (3–3) Hill
Research or readings, depending on students' interest and curricular needs. Hist 281 covers the period 1776-1890; Hist 282, the period 1890-1950. (Academic year)

283–84 **Readings/Research Seminar: Recent U.S. History** (3–3) Ribuffo
Prerequisite: six semester hours of 100-level American history courses. Research or readings depending on students' interests and curricular needs.

285 **Research Seminar: Women in the United States** (3) DePauw
Prerequisite: Hist 185 or equivalent. Practical examination of research, writing, and publication problems in the preparation of scholarly articles for feminist and historical journals. (Spring—alternate years)

286 **Research Seminar: Early American History** (3) DePauw
Practical skills associated with the production and marketing of historical writing. Each student will write a feature article on an aspect of early American history and edit the work of other members of the class. (Spring—alternate years)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Geog/Span 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

288 **Research Seminar: Problems in U.S.-Soviet-Chinese Relations** (3) Thornton
Development of scholarly skills through preparation of a research paper. Prerequisite: Hist 253–54 or 255–56. (Alternate years)

289 **Readings/Research Seminar: Modern Japanese History** (3) Sigur
Selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. Research or readings depending on students' interests and curricular needs. (Spring)

291 **Readings/Research Seminar: 20th-Century History** (3) Sachar
Research or readings on selected topics. (Fall)

292 **Israel, Zionism, and the Arab World** (3) Sachar
Research seminar. (Spring)

293 **Research Seminar: Modern East Asian History** (3) Johnson

294 **Research Seminar: The Modern Near East** (3) Davison
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries concerning countries from the Balkans, through Turkey and the Arab countries, to Iran. (Spring)

295–96 **Readings Seminar: Modern East Asian History** (3–3) Johnson

297 **Special Topics Seminar** (3) Staff
Open to doctoral and master's candidates and qualified undergraduates. May be repeated for credit. Offered whenever five or more students can be enrolled.

298 **Dumbarton Oaks Courses** (arr.)
Courses offered each year by scholars in residence at Dumbarton Oaks, Trustees for Harvard University, are open to qualified graduate and undergraduate students with permission of department chairman. Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Prerequisite to all fourth-group history courses: consent of instructor.

Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in the Institute seminar are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the History Department.

301–10 **Folger Institute Seminars** (3 credits each) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

342 **Readings in Modern European History** (3) Davison
From the French Revolution to the period following World War I. (Spring)

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the History and Economics Departments. Hist 379: American economic history. Hist 380: modern European economic history. (Academic year)

398 **Advanced Readings and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen *(Chairman)*, D. Hawkins, J.E. Snodgrass, D.C. Paup, J.D. Hunt
Adjunct Professor H.D. Bailey
Professorial Lecturers E.L. Shafer, C.A. Troester, Jr., T. Songster
Associate Professors L.H. George, M.R. Withers, N.D. Johnson
Associate Professorial Lecturers D.L. Edgell, W.M. Kane, D.M. Brody
Assistant Professor H. Nashman
Assistant Professorial Lecturers S.Y. Cha, P.G. Davidoff, J.V. Ackerman
Instructor A.H. Farbman
Lecturers E.A. Burkhardt, J.J. Goldblatt, C.D. Cox, M. Eblin, W. Woodson, H. Williams, S.L. Koskoff, D.G. Rivkind, W.K. Ellis, N.B. Smith, M.I. Greenbaum, D.V. Appel, G.C. Coon, D.S. Davidoff, B.M. Dwyer, G.L. Gimelstob, M.K. Grut, J.B. Kiesel, T.E. Sulkowski, G.V. Swengros, R.L. Vann, J. Vinson, C.M. Yglesias, S.D. Cook, B.M. Zeidman, J.S. Rosenthal

See the School of Education and Human Development for programs of study leading to the degrees of *Bachelor of Science in Human Kinetics and Leisure Studies* (opportunity for specialization in elementary and secondary school physical education, exercise and sport, travel and tourism, dance education, dance as a performing art, dance therapy) and *Master of Arts in Education and Human Development* (with specialization in adaptive physical education, dance, perceptual-motor development, general physical education, exercise science, therapeutic recreation, and tourism development and travel administration).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

First Group

With the exception of students pursuing undergraduate degrees in the School of Education and Human Development, credit for HKLS activities courses is not recognized for the baccalaureate. Most first-group courses are offered both in the fall and spring semesters and may be repeated with permission of the instructor.

10 Beginning Badminton (1)	**Breen**
13 Beginning Ballet Technique (1)	**Staff**
14 Beginning Intermediate Ballet Technique (1)	Staff
17 Beginning Modern Dance Technique (1)	**Staff**
18 Beginning/Intermediate Modern Dance Technique (1)	**Staff**
19 Dance (1)	Staff
20 Beginning/Intermediate Golf (1)	**Staff**
21 Foil Fencing (1)	**Staff**
22 Basketball (1)	**Staff**
24 Volleyball (1)	**Staff**
26 Tae Kwon Do (Korean) (1)	Staff
27 Beginning Tennis (1)	**Staff**
28 Intermediate Tae Kwon Do (Korean) (1)	Staff
29 Yoga (1)	**Staff**
30 Body Conditioning (1)	**Staff**
31 Roller Skating (1)	**Staff**
32 Beginning Swimming (1)	**Staff**
33 Swimming/Life Saving (1)	**Staff**

34 Intermediate Swimming (1) Staff
36 Springboard Diving (1) Staff
37 Soccer (1) Staff
38 Racketball (1) Staff
39 Handball (1) Staff
40 Squash (1) Staff
41 Team Handball (1) Staff
42 Aerobic Dance (1) Staff
43 Tai Chi (1) Staff
51 Gymnastics (2) Staff
Emphasis on apparatus and trampoline.
52 Dance Technique I (1, 2, or 3) Staff
53 Dance Technique II (1, 2, or 3) Staff
54 Intermediate/Advanced Tennis (2) Staff
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.
55 Swimming—Water Safety for Instructors (2) Staff
56 Scuba Diving (2) Staff
Laboratory fee, amount announced in *Schedule of Classes.*
57 Intermediate/Advanced Badminton (2) Breen
(Spring)
58 Intermediate Ballet Technique (1, 2, or 3) Staff
59 Team Sports (2) Staff
(Fall)
60 Racket Sports (2) Staff
(Spring)
61 Aquatic Leadership (2) Staff
(Fall)
62 Conditioning/Weight Training (2) Staff
(Spring)
63 Games and Movement Activities for Children (2) Staff
(Spring)
64 Horseback Riding (2) Staff
Laboratory fee, amount announced in *Schedule of Classes.*
65 Skiing (2) Staff
Laboratory fee, amount announced in *Schedule of Classes.* (Spring)
66 Synchronized Swimming (2) Staff
68 Sport Clinics (2) Staff
Special intensive study and skill development.
100 Experimental Course (3) Staff
Topic to be announced in *Schedule of Classes.*

Second Group

101 Issues in Physical Education, Exercise, and Sport (3) Swengros
Issues in physical education and sports programs in school and industry. Includes philosophy and curriculum.
102 Movement Analysis and Activities (3) Snodgrass
Human movement concepts applied to various fundamental activities and sports. (Fall)
103 Professional Foundations and Concepts of Human Kinetics and Leisure Studies (3) Snodgrass
Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.

104 **Introduction to Travel and Tourism** (3) Davidoff
Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism. (Fall)

105 **Introduction to Therapeutic Recreation/ Adaptive Physical Education** (3) Farbman, Songster
Philosophy, methods, and concepts relating to adaptive physical education and therapeutic recreation. (Fall)

106 **Introduction to Dance Therapy** (3) Greenbaum
General survey of dance therapy areas from theoretical and experimental points of view. Exploration of professional opportunities and training. (Fall)

107 **Ethnic Dance** (2) Johnson
Methods and materials of European folk and social forms of dance. Laboratory experiences assigned. (Spring)

108 **Dance Improvisation** (3) Woodson
Awareness of body movements, environment, group dynamics, performance and composition through improvisational technique. (Fall and spring)

109–10 **Dance Composition** (3–3) Withers
HKLS 109: basic elements and principles of composition. HKLS 110: advanced problems in composition. Prerequisite: HKLS 108 or equivalent. (Academic year)

111–12 **Sports Education Technique** (3–3) Staff
Techniques for teaching individual, dual, and team sports. (Academic year)

113–14 **Practicum** (3–3) Nashman
Pre-practice teaching or practical experience in related disciplines. (Academic year)

115 **Movement Technique for Theater** (2) Staff
Basic body awareness, sensory awareness, and movement exploration. Analysis of movement and dramatic justification of movement. May be repeated for credit. (Fall)

116 **Mime Movement and Theater** (2) Staff
Fundamentals of mime for the beginner. Isolation and illusion exercises. Work with masks, building improvisation and set pantomimes. May be repeated for credit. (Spring)

117 **Dance Education** (3) Johnson
Organizational, methodological, philosophical and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157. (Fall)

118 **Special Problems in Dance Composition** (1) Staff
Work with elements of movement leading to short composition studies. Prerequisite: HKLS 109–10 or equivalent. (Fall and spring)

119 **Creative Dance for Children** (3) Withers
Dance as an expressive art medium for children: concepts, principles, methods and materials. Emphasis given to dance in elementary education with consideration for special education.

120 **Repertory** (1 or 2) Staff
Study and performance of dance works. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

121 **Modern Dance Technique I** (1, 2, or 3) Staff
Intermediate/advanced modern dance. Prerequisite: HKLS 53 or equivalent. May be repeated for credit. (Fall and spring)

122 **Methods and Materials for Health Education** (3) Kane
Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials and evaluation; basic health knowledge. (Spring)

123 **Modern Dance Technique II** (1, 2, or 3) Staff
Advanced modern dance. Prerequisite: HKLS 121 or equivalent. May be repeated for credit. (Fall and spring)

129 **Introduction to Motor Learning** (3) Stallings
Concepts of motor skill learning applied to teaching and coaching skills. (Spring)

130 **Introduction to Motor Development** (3) Snodgrass
Study of the evolvement and refinement of fundamental movement skills throughout the life span. (Fall)

133 **Student Teaching** (6 to 12) Nashman
Prerequisite: HKLS 113-14 or equivalent. Admission by permission of instructor. (Fall and spring)

135–36 **Dance History** (3–3) Johnson
Study of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior. (Academic year)

137 **Dance and Movement Analyses** (3) Staff
Concepts and elementary principles of movement analysis with emphasis on effort and shape. (Spring)

138 **Organization, Administration, and Management of Physical Education, Sports, and Exercise Programs** (3) George
Curriculum, administration, and management related to physical education, sports, and exercise programs.

139 **Principles of Coaching** (3) Snodgrass
Study of behavioral patterns and interactions related to individual and team sports. (Spring)

141–42 **Theater Production for Dance** (3–3) Staff
Theory and practicum in technical aspects of dance production, lighting, sound, theater management, costuming, make-up, publicity, promotion, and audiovisual techniques. (Materials to be purchased.) (Academic year)

144 **Choreography** (3) Staff
Solo and group. May be repeated for credit. Prerequisite: HKLS 109–10 or equivalent; HKLS 141–42 recommended. (Fall and spring)

150 **Introduction to Human Anatomy** (3) Stallings
Systematic study of the structure of the human body, with emphasis on joints, muscles, and neuromuscular mechanisms. (Fall)

151 **Kinesiology** (3) Paup
Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: an approved course in anatomy. (Spring)

156 **Application of Recreational Skills to Contemporary Lifestyles** (3) George
Development of recreational skills; emphasis on local opportunities for recreational activities. Current trends in community recreational development and program planning. May be repeated for credit with permission of instructor. (Fall and spring)

157 **Dance Technique Theory** (3) Withers
Theoretical foundations of dance. Applied principles of kinesiology, analysis and practice of contemporary dance techniques. (Fall)

158 **Safety: Prevention and Care of Sports Injuries** (3) Staff
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

164 **Physiology of Exercise** (3) Paup
The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

171 **Current Professional Literature and Competencies** (3) Snodgrass
Study of current literature with implications for HKLS specializations; use of library resources and retrieval systems; evaluation of professional competencies. Prerequisite: HKLS 103 or permission of instructor.

172 **International Experiences** (1 to 6) Staff
Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit.

175 **Music for Dancers** (3) Staff
Rhythmic theory and analysis; resources in music and accompaniment principles for dance. Prerequisite: basic knowledge of rhythmic theory. (Spring, even years)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler
Same as Educ 178.

184 **Workshop** (1, 3, or 6) Staff
Titles announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

187–88 **Sign Language and Deafness** (3–3) Donnels and Staff
Same as Educ 187–88.

190 **Sales Management for Travel Agents** (3) Davidoff
An in-depth study of agency products and services, with methodologies for maximum control and efficiency. (Fall)

191 **Business Management for Travel Agents** (3) Davidoff
Basic principles of business administration applied to small businesses in general and to travel agencies in particular. General management concepts (planning, organizing, leading, and controlling), with specific applications in management areas, including personnel, finance, office operations, law, and insurance. (Spring)

192 **Marketing Management for Travel Agents** (3) Davidoff
Marketing theories as applied to the travel agency. Coverage of the marketing mix in travel, market segmentation, market planning, and the use of advertising and other communications techniques. Emphasis on increasing profitability through planned marketing programs. (Fall)

193 **Domestic and International Tourism** (3) Davidoff
An overview of tourism theory, with emphasis on how such knowledge can help the travel agent understand and improve his or her function. Emphasis on the psycho-social aspects of tourism on the traveller and host community. Economic and social impacts are discussed. (Spring)

200 **Experimental Course** (3) Staff
Topic to be announced in *Schedule of Classes*.

Third Group

202 **Conceptual Basis of Motor Learning** (3) Stallings
Variables of perceptual motor learning and performance; theories, concepts, and models of learning applied to teaching and coaching. (Fall and spring)

205 **Perceptual-Motor Programs: Diagnostic-Therapeutic Techniques** (3) Stallings
Programs of perceptual-motor therapy and their basic assumptions and diagnostic-therapeutic techniques. (Spring)

230 **Advanced Concepts in Motor Development** (3) Snodgrass
Study and practice in techniques of critical observance and analysis of motor behavior throughout the life span, with special emphasis on period from birth to age eight and on the aged. (Spring)

232 **Current Issues in Elementary School Physical Education** (3) Snodgrass
Current philosophy, trends, and research; implications for curriculum, instruction, evaluation. (Spring)

239 **Administration of Therapeutic Recreation Services** (3) Staff
Development of recreation and tourism opportunities for disabled, elderly, and other special populations; emphasis on administrative competencies in community organization, communications, consultation, program development, evaluation, and fiscal management. (Spring)

240 **Physical Education for the Handicapped** (3) Songster
Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications. (Fall)

244 **Therapeutic Recreation Practice** (3) Farbman
Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, and relationship of therapeutic recreation to total rehabilitation goals. (Spring)

245 **Medical Aspects of Disabilities and Handicapping Conditions** (3) Ellis
Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions; implications for programming and facility development as related to therapeutic recreation, adaptive physical education, and other therapies. (Fall)

249 **Economic, Sociocultural, and Ecological Aspects of Tourism** (3) Hawkins
Impact of leisure on cultural development and social values; specific emphasis on psychosocial aspects of tourism and recreation. May be taken for undergraduate credit with permission of the instructor. (Fall)

250 **Administration of Travel and Tourism Services** (3) Hunt
Organization and management concepts, theories, and issues, stressing application of theory through analysis of short case examples drawn from the broader range of the travel and tourism industry.

251 **Theories and Techniques of Leisure Lifestyle Planning** (3) Smith
Overview of theories and concepts of leisure counseling, leisure education, and total leisure lifestyle planning. Emphasis on methods and techniques of leisure assessments, attitudinal change, and facilitating leisure planning for special populations as well as the general public.

252 **Supervision in Therapeutic Recreation** (3) Smith
Roles and functions of supervision in therapeutic recreation and

service. Didactic and experiential activities related to problem-solving in supervision. Emphasis on group dynamics and interpersonal communication skills in supervisory responsibilities.

255 **Fitness Evaluation and Exercise Prescription** (3) Paup
Methods and techniques for providing individualized exercise and fitness prescriptions based on measurement and evaluation of physical fitness and health-related variables. Prerequisite: HKLS 150, 164. (Spring)

256 **Sports Medicine** (3) **Brody**
Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries.

257 **Principles and Concepts of Employee Health/Fitness Programs** (3) Swengros
General overview of the employee health/fitness movement in the U.S. and other countries. Public and private health policy implications will be analyzed together with national economic and political trends relating to the subject. Evaluation of model programs, procedures, and current practice.

258 **Organization and Management in Health/Fitness** (3) Swengros
Analysis of organization and management theory as it applies to current political and economic problems related to the health and fitness industry. Emphasis on leadership development for resolving conflict and implementing change.

259 **Exercise, Stress, and Cardiac Rehabilitation** (3) Staff
Applied physiology of exercise and psychological stress in relation to coronary artery disease and myocardial infarction; the principles and practice of rehabilitation of patients recovering from a coronary event (heart attack or heart surgery) by exercise therapy and risk-factor reduction. Prerequisite: HKLS 164. (Fall)

260 **Tourism Development** (3) **Dwyer**
Relationship of economic theory and principles to tourism development; applications of economic analysis techniques to the travel and tourism field. (Fall)

261 **Planning for Tourism** (3) Staff
Integrated planning for travel and tourism organizations, financial and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall)

262 **Tourism Policy Analysis** (3) Edgell
Understanding components of tourism policy, development of tools for tourism policy analysis, and description of tourism organizations in the government and private sector. (Spring)

263 **Tourism Marketing** (3) Staff
Concepts and techniques employed in marketing travel industry products and services, including its public and private sector components. Assessment of the tourism product, development of the marketing strategy, preparation of the marketing plan, and analysis of specific promotional programs. (Fall and summer)

265 **Sports and Politics** (3) **Troester**
Political analysis applied to sports policy; comparative approach to the study of the relationships between ideology, economic development, and the types and levels of government involvement in sports policy.

270 **Philosophic Foundations of Dance** (3) **Johnson**
Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism. (Spring)

271 **Dance Reconstruction** (1 to 3) Staff
Recreating the structure and dynamics of movement from dance scores. (Fall and spring)

273 **Advanced Choreography** (3) Staff
Group or solo choreography. Course work includes responsibility for auditions, rehearsals, and presentation in concert. May be repeated once for credit. Prerequisite: HKLS 144 or equivalent. (Fall or spring)

276 **Dance in Society** (3) Johnson
Anthropological aspects of dance; emphasis on current research and literature.

280 **Advanced Workshop** (1 to 3) Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)

282 **International Experiences** (1 to 12) Staff
May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) Staff
Field work, internship and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 **Advanced Seminar** (1 to 3) Staff
May be repeated for credit with approval of advisor. (Fall and spring)

293 **Independent Study** (1 to 6) Staff
May be repeated for credit with approval of advisor.

296 **Systems Analysis of Tourism Services** (3) Shafer
Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall)

297 **Advanced Topical Studies** (3) Breen and Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. (Fall and spring)

299 **Thesis Research** (6) Staff

HUMANITIES

Committee on the Humanities
O.A. Seavey *(Coordinator)*, D.A. Altshuler, J.F. Burks, R.P. Churchill, E. Fisher, J. Gold, R.A. Hadley, R.G. Jones, R.W. Kenny, J.D. Moreno, J.A. Quitslund, J.S. Varden, D.D. Wallace, J.E. Ziolkowski

Columbian College of Arts and Sciences offers a set of interdisciplinary courses designed to provide a coherent introduction to classic works in the humanities. The courses deal with historical figures, creative works of art and literature, systems of philosophy, and religious traditions that are the common property of educated people. The full interpretation of these fundamental sources of Western culture requires the collaboration of faculty from all the disciplines of study encompassed in the humanities.

Columbian College students may use up to 6 semester hours of these courses toward the fulfillment of the meaningful initiation requirement in the humanities.

1 **Roots of the Western Tradition** (3) Staff
(Formerly Clas/Engl/Hist/Phil/Rel 41)
Basic ideas of Western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. To be taken in conjunction with Engl 13. (Spring)

2 **Ideas in Western Culture: Aquinas to Voltaire** (3) Staff
An examination in historical context of central texts from the Middle Ages, the Renaissance, and the Enlightenment: Aquinas, Dante, Machiavelli, Erasmus, Luther, Montaigne, Bacon, Shakespeare, Cervantes, Galileo, Descartes, Milton, Locke, and Voltaire. To be taken in conjunction with Engl 14. (Fall)

INDIVIDUAL GRADUATE PROGRAMS

Committee on Individual Programs
J.J. Cordes *(Program Director)*, B.L. Catron, R.S. French, W.B. Griffith, T.L. Hufford, P.H.M. Lengermann

The Graduate School of Arts and Sciences offers the course listed below primarily for students with individualized interdisciplinary programs of study for the Master's degrees. The Committee on Individual Programs, which has supervisory responsibility for Individual Programs students, provides the faculty for the Colloquium.

250 **Colloquium on Interdisciplinary Methodologies** (3) Staff
Analysis from several perspectives of the problems inherent in interdisciplinary study and research, conditions which justify interdisciplinary work, norms and strategies for success, and case studies. Required for all students in Individual Programs. Open to other interdisciplinary students with permission of the Colloquium Director. (Spring)

INSTITUTE FOR SINO-SOVIET STUDIES

Members of the Institute
G. Sigur *(Director)*, M. Atkin, C.F. Elliott, M.W. Fu, A. Gyorgy, H.C. Hinton, W.R. Johnson, Y. Kim, C.A. Linden, C.A. Moser, J. Pelzman, V. Petrov, C. Shih, M. Sodaro, R. Thornton, S. Wolchik, R.Y. Yin

Associate Members of the Institute
J. Banister, J.J. Dziak, E.M. Hadley, J. Hardt, T. Hsia, D.S. Kamerling, W.H. Lewis, B. Ramundo, P.A. Smith, E.L. Warner

The Institute for Sino-Soviet Studies offers specialized graduate study in the School of Public and International Affairs. Students who lack background in Soviet and East Asian studies are required to take undergraduate courses selected by the advisor as prerequisite to graduate work. Related preparatory undergraduate courses include the following: Econ 101, 102, 133, 134, 169, 170; Hist 137, 138, 143, 144, 145, 146, 187, 188, 189, 195, 196; PSc 1, 9, 106, 107, 108, 131, 165, 168, 170, 173; Psyc 151.

The objectives and programs of the Institute are stated under the School of Public and International Affairs. For description of the courses listed below, see the appropriate departmental listing.

ECONOMICS

267 *Seminar: Soviet Economy* (3)	Hardt
268 *Seminar: Economic Theory and Development in Communist Countries* (3)	Hardt
269 *Economy of the People's Republic of China I* (3)	Yin
270 *Economy of the People's Republic of China II* (3)	Yin
271 *Economy of Japan* (3)	Hadley
281 *International Economics* (3)	Pelzman
367 *Seminar: Soviet Planning in Theory and Practice* (3)	Pelzman

GEOGRAPHY AND REGIONAL SCIENCE

224 *Seminar: Political Geography* (3)	Pederson
265 *Seminar: Geography of the Soviet Union* (3)	Kamerling
266 *Seminar: Geographic Perspectives on Contemporary China* (3)	Banister

HISTORY

205 *Evolution of Nationalism in Eastern Europe* (3)	Staff
206 *Readings Seminar: Revolution in Eastern Europe* (3)	Staff
215 *Readings Seminar: Communist Monolith that Never Was* (3)	Staff
217 *Readings/Research Seminar: Russian and Soviet Thought* (3)	Atkin
232 *Comparative Communist Systems I* (3)	Wolchik
233 *Comparative Communist Systems II* (3)	Wolchik
237 *Readings Seminar: Soviet Foreign Policy, 1917-1964* (3)	Petrov
246 *Readings/Research Seminar: History of Modern Russia and Soviet Union* (3)	Atkin
253–54 *Readings Seminar: History of Sino-Soviet Relations* (3–3)	Thornton
255–56 *Readings Seminar: U.S.-Soviet Strategic Relations Since World War II* (3–3)	Thornton
258 *Communist Party of the Soviet Union* (3)	Sodaro
288 *Research Seminar: Problems in U.S.-Soviet-Chinese Relations* (3)	Thornton
289 *Readings/Research Seminar: Modern Japanese History* (3)	Sigur
293 *Research Seminar: Modern East Asian History* (3)	Johnson
295–96 *Readings Seminar: Modern East Asian History* (3–3)	Johnson

POLITICAL SCIENCE

207 *Readings in Socialism and Communism* (3)	Elliott, Linden, Wolchik
208 *Readings in Marxism and Leninism* (3)	Elliott, Linden
230 *Comparative Goverment and Politics I* (3)	Kim, McClintock, Feigenbaum
231 *Comparative Government and Politics II* (3)	Kim, McClintock, Feigenbaum
232 *Comparative Communist Systems I* (3)	Wolchik
233 *Comparative Communist Systems II* (3)	Wolchik
258 *Communist Party of the Soviet Union* (3)	Sodaro
263 *Communism in Non-Communist Europe* (3)	Sodaro

264 *The International Politics of Eastern Europe* (3)	Gyorgy
265 *Governments and Politics of Eastern Europe* (3)	Gyorgy
266 *Readings in Soviet Government and Politics* (3)	Elliott, Linden
267 *Soviet Government and Politics* (3)	Elliott, Linden, Wolchik
268 *Soviet Foreign Policy* (3)	Elliott
269 *Soviet Military Policy and Strategy* (3)	Elliott
270 *Politics of the People's Republic of China I* (3)	Hinton
271 *Politics of the People's Republic of China II* (3)	Hinton
272 *Foreign Policy of the People's Republic of China* (3)	Hinton
275 *International Politics of the Far East* (3)	Hinton
276 *Government and Politics of Japan and Korea* (3)	Kim
291 *Colloquium: East Asia* (3)	Hinton
292 *Colloquium: Russia and Eastern Europe* (3)	Gyorgy

INTERNATIONAL AFFAIRS

See **School of Public and International Affairs.**

ITALIAN

See **Romance Languages and Literatures.**

JAPANESE

See **East Asian Languages and Literatures.**

JOURNALISM

Professorial Lecturers F.L. Dennis, C.W. Puffenbarger, J. Coldsmith
Associate Professors R.C. Willson, P. Robbins *(Chairman)*
Adjunct Associate Professor J. Deakin
Associate Professorial Lecturers R.L. Courage, J.P. McGill, E. Rogers, W.R. Fonda, C. Blount, R.R. Mueller, T.O. Cron, D. Haun, J.P. Martin, J.R. Fogarty, D.L. Smith, S.B. Welchman, F.G. Graves, E.H. Moore, J.E. Sharkey

Bachelor of Arts with a major in journalism (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)
2. Prerequisite courses—Engl 51–52 or 71–72; Jour 71–72; PSc 1 and 2 or 2 and 3.
3. Required courses in the major—24 hours of second-group courses in Journalism, including (a) Jour 111, 196, 198; (b) nine semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155; and (c) 6 semester hours chosen from Jour 115, 116, 117, 128, 129, 140, 141, 142, 145, 146, 150, 170, 190, 199.
4. Required as a secondary area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study.

Recommended electives: Econ 121, 142, 157, 161, 162, 181–82; PSc 110, 111, 112, 114–15, 116, 118, 119, 120, 122; Psyc 115; SpDr 132, 133, 134, 135–36; Stat 53, 105, 107.

Minor in journalism—The student must complete 21 semester hours in journalism, including Jour 71 or 72; Jour 111; one course selected from Jour 115, 116, 117, or 170; three courses selected from Jour 121, 125, 133, 135, 137, 138, 139, 151, or 155; and any one other journalism course.

Departmental prerequisite: Jour 111 is prerequisite to Jour 125, 133, 135, 137, 138, 139, 190 and 196.

First Group

71–72 **Introduction to Mass Communication** (3–3) **Willson**
Jour 71: evolution of newspapers and other media in relation to political, social, and economic life; concept of press freedom. International students who lack knowledge of U.S. history should take Hist 71–72 before taking Jour 71. Jour 72: mass media, problems of contemporary journalism, emphasis on federal government-media relations. (Academic year)

Second Group

111 **Reporting** (3) **Robbins**
Gathering, evaluating, and writing news. Typing required. Laboratory fee, $10. (Fall and spring)

115 **Newspaper Editing and Make-up** (3) Coldsmith
Preparation of news copy, pictures, and other graphic material for publication; evaluation of news; page layouts; newspaper make-up. (Fall and spring)

116 **Magazine Layout and Design** (3) Smith
Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 **Magazine Editing** (3) Graves
The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring)

121 **Feature Writing** (3) **Willson**
Free-lancing nonfiction articles, materials obtained through independent investigation. (Fall and spring)

125 **Science Writing** (3) **Staff**
Writing science news for the mass media. (Spring)

128 **Government Process and the Media** (3) Deakin
(Formerly Jour/PSc 721)
Examination of the roles played by the news media that affect the political process, including the impact the media have on the Presidency, the Congress, and the bureaucracy, and the adequacy of news organizations to provide information and analysis needed by citizens to exercise effective self-government. Same as PSc 128.

129 **TV News: The Politics of Visibility** (3) Lichter
Same as PSc 129.

133 **Advanced Reporting: Community News** (3) **Puffenbarger**
Coverage and writing of local news. (Fall)

135 **Advanced Reporting: Consumer Affairs** (3) **Cron**
Specialized training in the consumer news field. (Fall)

137 **Advanced Reporting: National Affairs** (3) Fogarty
Coverage and writing of federal government news. (Fall)

138 **Investigative Reporting** (3) **Puffenbarger**
In-depth reporting in selected areas of political, economic, and social affairs. Prerequisite: Jour 133 or permission of instructor. (Spring)

139 **Advanced Reporting: Radio and Television News** (3) Blount
Preparing news and public affairs programs for broadcast media. (Spring)

140 **Photojournalism** (3) **Fonda**
Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print paper. Laboratory fee, $54. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

141 **Intermediate Photojournalism** (3) Welchman, Haun
Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $54. Prerequisite: Jour 140 or Art 23 and 24. (Spring)

142 **Advanced Photojournalism** (3) Staff
Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $54. Admission by permission of instructor. (Spring)

145 **Principles and Problems of Public Relations** (3) McGill, Mueller
Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring)

146 **Government Information** (3) **Courage**
Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

150 **News Coverage in Washington** (3) Willson
The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings.

151 **Editorial Writing** (3) **Robbins**
Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. (Spring)

155 **Critical Writing and Reviewing** (3) Martin
Reviewing and commenting on the arts and entertainment for the mass media. (Fall)

170 **News Publication Management** (3) **Coldsmith**
The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 **Internship in Journalism** (3)
Study of a journalistic medium in action by working in a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

195 **Documentary Photography** (3) Battaglia
Same as Art 195.

196 **Senior Project** (3) **Staff**
Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval, and filed with the student's advisor in the semester before registration. (Fall and spring)

198 **Law of the Press** (3) **Dennis**
Freedom of the press, censorship, legislative controls, publication as

contempt of court, copyright, newsgathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

199 **Special Topics in Journalism** (3) Staff
Selected topics: writing, editing, graphics, photojournalism, or other aspects of communication. May be repeated for credit.

JUDAIC STUDIES

Committee on Judaic Studies
D.A. Altshuler *(Chairman)*, R.H. Davison, R.G. Jones, T.Z. Lavine, B. Nimer, B. Reich, H.M. Sachar, M. Ticktin, H.E. Yeide, Jr., J.E. Ziolkowski

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see Religion].)

Bachelor of Arts with a major in Judaic Studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.
3. Required courses for the major (30 semester hours):
   (a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.
   (b) two meaningfully related courses selected from each of two of the following groups: I—Anth 177, 180; Art 111, 112; II—Clas 100, 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 171, 172, 193, 194, 292, 293, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—PSc 177, 178, 277, 278, 290; VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 209, 291, 292.

Students applying for the 90-hour degree program in Judaic Studies must, in addition to meeting the general requirements stated under Columbian College of Arts and Sciences, present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and/or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

Minor in Judaic Studies—Required: A minimum of 18 semester hours, chosen in consultation with an advisor designated by the Committee on Judaic Studies, from Clas 21–22, 23–24, 25–26, 100, 101, 102, 103, 104; Hist 158; PSc 179; Rel 9, 23, 103, 107, 113, 114, 115, 116, 174, 184, 209, 213, 238.

LATIN

See **Classics.**

LATIN AMERICAN STUDIES

Committee on Latin American Studies
M. Gordon *(Chairman)*, C. Allen, B.L. Boulier, T.F. Carroll, M. Grow, J. Grunwald, R.L. Humphrey, Jr., P.F. Klarén, M. Koch-Weser, E. Marasciulo,

C. McClintock, T. Morrison, G. Palacios, J.W. Robb, L.R. Scheman, F.R. Siegel

Bachelor of Arts with a major in Latin American Studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Required courses in related areas—Span 1–2, 3–4; or equivalent. (Span 9-10 or equivalent is recommended.)

3. Required courses in the major—(a) Anth 172, 185, or 190; Econ 185; Geog 161; Hist 163–64; PSc 183–84; and six semester hours chosen from Span 151–52, 155–56, 157–58, or other approved courses; (b) 18 semester hours, including an interdisciplinary seminar (287) in one of the following areas: anthropology, economics, geography and regional science, Hispanic literatures, history or political science. The required courses listed in (a) which are in the selected area may be included in computing the required 18 semester hours for (b).

Minor in Latin American Studies—Required: one Latin American course in each of the six member disciplines (anthropology, economics, geography, history, political science, and Spanish-American literature). Two years (or equivalent) of Spanish language is prerequisite.

Master of Arts in the field of Latin American Studies—See the School of Public and International Affairs.

Candidates for the degree of Doctor of Philosophy may elect Latin American history as an area of specialization in the field of history, Spanish American literature as an area of specialization in the field of Romance languages and literatures, or politics of Latin America as an area of specialization in the field of political science.

Courses Dealing with Latin America:

Anthropology—115, 170, 172, 185, 190, 215, 262, 268, 272, 282, 287
Economics—185, 233, 234, 251, 252, 285–86, 287, 290, 291
Geography and Regional Science—127, 133, 161, 223, 250, 261, 287, 290, 291
History—161, 162, 163-64, 165, 166, 261, 262, 287
Political Science—183, 184, 283, 284, 285, 289
Portuguese—31–32
Spanish—91–92, 151–52, 155–56, 157–58, 253, 255, 256, 261, 264, 266, 287

LEGISLATIVE AFFAIRS—GRADUATE PROGRAM

Academic Director C. Deering

The Graduate School of Arts and Sciences offers a program leading to the degree of Master of Arts in the field of legislative affairs. This program focuses on Congress and is designed to help understand and analyze problems of the legislative process.

Master of Arts in the field of legislative affairs—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 33 hours of course work. The required curriculum includes four courses from Group I and two courses each from Groups II and III. The remaining courses are selected in consultation with the advisor. All students must pass a Master's Comprehensive Examination.

Group I. Legislative Theory and Research
PSc 203 *Public Policy Analysis* (3)
PSc 204 *Methods of Legislative Research* (3)
PSc 218 *Legislative Theory and Behavior* (3)
PSc 234 *Comparative Legislative Systems* (3)

Group II. The Processes of Politics
PSc 212 *State and Urban Politics* (3)
PSc 215 *Judicial Policy-making* (3)
PSc 216 *American Presidency* (3)
PSc 219 *American Political Parties and Electoral Behavior* (3)
PSc 220 *Public Opinion and Political Socialization* (3)
PSc 286 *Selected Topics in American Politics* (3)

Group III. Public Policy Analysis
PSc 222 *Government, Science, and Technology* (3)
PSc 224 *Domestic Policy Analysis—Selected Topics* (3)
PSc 225 *Economic Policy Analysis—Selected Topics* (3)
PSc 226 *Legislative Elements in Economic Policy Development* (3)
PSc 248 *U.S. Foreign Policy* (3)
PSc 249 *U.S. National Security Policy* (3)
PSc 250 *Foreign Policy Analysis—Selected Topics* (3)

MANAGEMENT SCIENCE

Professors M.M. Wofsey *(Emeritus)*, R.F. Ericson, G.L. Lippitt, D.D. Roman, P.B. Vaill, J. Harvey, E.B. Adams, W.E. Halal, E.H. Forman
Professorial Lecturers T. O'Connor, R.H. Walther, Z.A. Shavell
Associate Professors J.F. McCarthy, Jr., E.K. Winslow *(Chairman)*, W.W. Hardgrave, J.P. Coyne, S. Umpleby, E.W. Hahn, J. Lobuts, Jr., J.H. Carson, L. Graff, J.D. Frame

See the School of Government and Business Administration for programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Master of Science in Information Systems Technology, Doctor of Business Administration, and Doctor of Public Administration.

Second Group

107 **Fundamentals of Behavioral Science** (3) Lobuts, Winslow
Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes which contribute to the functioning of organizations.

118 **Introduction to Information Processing** (3) Carson, Coyne, Forman
Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SGBA computer.

119 **Computer Programming for Information Systems** (3) Coyne, Carson
COBOL programming for business and government data processing applications. For students already familiar with basic computer con-

cepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 107.

120 **Information Systems Development I** (3) Coyne, Carson
Assessment of the systems concept and its relationship to organizational information decision-making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, e.g., systems analysis and design phases. Modern programming techniques are emphasized. Prerequisite: Mgt 118, 119; or permission of instructor. Laboratory fee, $25.

121 **Information Systems Development II** (3) Carson, Coyne
A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 120 or permission of instructor.

122 **Special Studies in Information Systems** (3) Carson, Coyne
An independent or group-study project in information systems development which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 121 or permission of instructor.

Third Group

201 **Issues Management** (3) Adams, Halal, Vaill
An advanced management course designed to explore contemporary issues of organizations and management. Current literature and recent research findings will be analyzed. Topics include productivity, social responsibility, government regulations, consumerism, and employee participation. Prerequisite: Mgt 205 or equivalent.

205 **Organization and Management** (3) Vaill, Adams, Ericson, McCarthy, Brown, Roman, Halal, Loeser
(Formerly Mgt 200)
For designated students in the MBA program. Integrative approach to organizational concepts, management principles, philosophy and theory in public and private organizations. Evolution of management thought, functions, and practices, stressing present management approaches, general systems theory, and contingency management.

210 **Individual and Group Dynamics in Organizations (3)** Harvey, Lippitt, Winslow, Vaill
For graduate students who wish to improve their skills in dealing with human behavior in organizations. Theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individuals and groups in various organizational settings. Intensive work group experience focusing on theory, research, and group analysis.

211 **Current Issues in Organizational Behavior** (3) Winslow
Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems. Problems in behavioral science research. Prerequisite: Mgt 210.

212 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow
Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning in various settings and to demonstrate competence in

various media. This course emphasizes the relationship between theory and practice. Prerequisite: Mgt 210 or permission of instructor.

213 **Organizational Development: Concepts and Methods** (3) Lippitt, Harvey, Vaill

Primarily for doctoral students. Examination of different concepts of organizational structure, processes, and growth. Models of organizational change will be developed with a taxonomy of methods of initiating action to further organizational development. Prerequisite: Mgt 210, 212; or equivalent.

214 **Consultative Processes in Organizations** (3) Lippitt, Harvey

Examination through actual practice, as well as theory, of the nature of the helping process between one person or group and another person or group. Dynamics of the consulting process will be explored as well as role differences in internal and external consultation. Development of skill in the helping relationship will be furthered. Prerequisite: Mgt 210, 212; or equivalent.

215 **Conflict Management: Theory, Concepts, and Methods** (3) Lippitt

Exploration of the ways power is used in conflict situations. Students will discuss and experience ways to make conflict a creative rather than a negative experience. Methods of conflict resolution will be practiced. Conflict in the micro (person-to-person) to macro (system-to-system) level will be explored. Prerequisite: Mgt 210 or permission of instructor.

218 **Computer Programming with Business Applications** (3) Graff, Hahn, Coyne, Carson, Forman

For designated students in the MBA program. Basic principles, terminology, and organization of computer systems. Emphasis on developing a proficiency in the use of higher-level programming language via computer solutions to production management and accounting problems. Laboratory fee, $25.

220 **Quantitative Factors in Administration** (3) Hahn, Forman, Hardgrave

Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such models. Topics selected from linear programming, probability, decision-making under uncertainty, queuing and inventory models, simulation, regression. Prerequisite: Mgt 218, 270, or equivalent. (Fall and spring)

221 **Introduction to Probability Theory and Applications** (3) Hardgrave, Hahn, Forman

Introduction to probability theory and its applications in management science and operations research; foundation course for further study of advanced probabilistic methods in operations research. Sample spaces, conditional probability, common distributions, random variables, simple stochastic processes. Prerequisite: Math 42 or 52 or equivalent. (Fall)

222 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Hahn

Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Math 42 or 52 or equivalent. (Fall)

223 **Techniques of Operations Research** (3) Hardgrave, Forman, Hahn
Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 221, 222. (Spring)

229 **Modeling in Applied Operations Research** (3) Hardgrave
Advanced modeling exercises in applied operations research. Prerequisite: Mgt 223 or permission of instructor. (Spring)

230 **Administration of Research and Development** (3) Frame, Roman
Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement and evaluation. (Fall and spring)

231 **Project Management** (3) Roman
Specialized aspects of project management, including development of requests for proposals; proposal preparation; project selection, management, and costing; and project managers. Project management skills applicable in a variety of organizational settings where projects are used to accomplish operational objectives.

232 **International Science and Technology** (3) Frame, Roman
Technology transfer to advanced countries and LDCs; the technological basis of trade; international licensing, patenting and co-production activities; science, technology, and economic development; international comparisons of scientific and technological capabilities; current global issues involving technology; global transfer of military technologies; export controls of technology. (Fall and spring)

235 **Technological Entrepreneurship and Innovation** (3) Frame, Roman
An examination of the legal, organizational, personnel, financial, marketing, and production aspects of establishing and maintaining technology-based ventures. Special attention focuses on patent protection, trade secrets, licensing strategies, financial resources, tax implications, and venture management approaches. Case studies of recent high- and low-technology ventures.

239 **Seminar: Administration of Research and Development** (3) Roman, Frame
Individual and/or group in-depth research projects dealing with various phases of research and development management. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: six to nine semester hours of research and development management or permission of instructor. (Fall)

240 **Survey of Information Technology** (3) Graff, Adams, Carson
Management-oriented survey of key areas in information technology including hardware, software, systems development, management and the computing milieu. Prerequisite: Mgt 218.

241 **Information Systems Development and Application** (3) Coyne
An advanced course in information technology, emphasizing philosophies, principles, and practices common to the development and application of information systems. Different approaches are studied, case study materials are evaluated, and the various roles of the technical staff are considered. Prerequisite: Mgt 118. (Fall and spring)

242 **Comparative Computer Systems** (3) Carson
Characteristics and capacities of the range of information processing

equipment in use today. Recent and prospective equipment and software development. Selection of computers and related software and equipment. Prerequisite: Mgt 240 or permission of instructor. (Spring)

243 **Management of Information Technology** (3) Adams
Advanced course emphasizing principles, practices, and trends in the management of information technology. Case studies. Prerequisite: Mgt 240, 242; or permission of instructor. (Fall and spring)

244 **Information Systems and Telecommunications** (3) Carson, Forman
Principles of telecommunications; applications of telecommunications for the transmission of data communications to enhance the flow of information within an organization. Identifying opportunities for applying technology in ways that will support the efforts of an organization. Terminology, hardware and software considerations, and calculations necessary for the specification and design of telecommunication systems. Prerequisite: Mgt 118. (Fall)

245 **Data Base Systems** (3) Coyne
An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and maintenance; evaluation criteria; standardization of data base systems; impact of packaged data management systems; and analysis of the current state-of-the-art in data base development. Prerequisite: Mgt 118. (Fall and spring)

246 **Workshop in Data Base Systems** (3) Coyne, Forman
Analysis and solution of complex information problems through commercially available data base systems; development of evaluation methodology, comparison of implementation strategies. "Hands-on" experience with at least four major commercial systems. Prerequisite: Mgt 119, 245. (Fall and spring)

247 **Higher-Level Programming Languages for Information Systems** (3) Forman
Use of major programming languages in information technology. Topics for each language include syntax and semantics, ease of learning, coding and debugging, documentation standards and maintenance, suitability for particular problem areas and projected users; availability of languages on large-scale through minicomputers. A comparative analysis of these language and conversion problems is also discussed. Prerequisite: Mgt 118. (Fall)

248 **Design of On-Line Information Systems** (3) Carson, Forman
Introduction to the analysis, design, and implementation of on-line business information systems. Topics include requirements analysis, functional specifications, file design, man-machine dialogue design, response time requirements, user psychology. Prerequisite: Mgt 244 or 245; Math 51, 52. (Spring)

249 **Seminar: Information Technology** (3) Carson
Current trends in the design and implementation of computer-supported systems; emphasis on current state-of-the-art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 240, 242, 243; or permission of instructor. (Fall and spring)

250 **Operating Systems** (3) Carson
Principles of operating systems; role of the operating system in resource allocation activities inherent in large-scale digital computers. The specialized functions of these systems are defined, and logical

requirements of each are specified, including data structuring, multiprogramming, I O spooling, and job control. Commercial operating systems will be studied as examples. Prerequisite: Mgt 120, 121. (Fall)

251 **Microcomputer Applications** (3) Hahn, Carson, Forman
An in-depth approach to the understanding and use of microcomputer systems. Principles of microcomputers and distinguishing characteristics among various microcomputer systems. Students work individually with the microcomputer system in the laboratory. Prerequisite: Mgt 122. Laboratory fee, $25. (Spring)

252 **Information Resources Management** (3) Adams
Concepts and tools for integration of information systems, management systems, and organizational systems. Information as a resource, cost and value assessments, budgeting and accounting structures, and evaluation of information as a resource. Prerequisite: Mgt 200, 240, or equivalent.

253 **Security and Privacy of Information Systems** (3) Adams, Forman
An advanced course in information technology, emphasizing the philosophies, principles, and practices of security management in and impact of privacy legislation on computer-based systems. Risk assessment, state of the art measures, trends in the information security field, and roles of the various levels of management and technological staff. Prerequisite: Mgt 218 or 240.

261 **Introduction to General Management Systems** (3) Ericson, Umpleby
Dynamics of organization and management from a general systems and cybernetics viewpoint. Translation of general management systems research and theory into the world of organizational behavior and management practice. (Fall and spring)

262 **Systems Designs For Managerial Effectiveness** (3) Ericson, Umpleby
Building on the introduction and cybernetics concepts in Mgt 261, this course provides a more advanced set of insights into how these ideas are utilized in building effective organizations in this era of turbulent environments. Prerequisite: Mgt 261. (Fall and spring)

263 **Case Studies and Field Research in GEMSOC** (3) Ericson, Adams, Umpleby
Investigation of existing organizational structures and ongoing management processes from a general management systems standpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Prerequisite: Mgt 261. (Spring)

264 **GEMSOC Modeling and Simulation** (3) Umpleby, Adams, Ericson
Literature review and current practice analysis; modeling and simulation exercises. Continuous and discrete representations: system dynamics, set theory, kinematic graphs, information theory. Prerequisite: Mgt 261. (Fall)

265 **Organizational Cybernetics** (3) Umpleby, Ericson
Introduction of a cybernetic model of decision-making and a theory of societal evolution, with application to practical problems of institutional design and institutional change.

266 **Principles of Cybernetics** (3) Umpleby, Ericson
Basic concepts in cybernetics and systems theory, emphasizing their interdisciplinary nature. Characteristics of systems, strategies for regulating systems, and paradoxes involved in self-regulation. Applications to the social sciences are emphasized.

270 **Mathematics and Statistics for Management** (3) Hahn, Forman, Graff, Hardgrave
For designated students in the MBA program. Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, regression, and correlation.

275 **Managerial Statistics I** (3) Forman, Hahn, Hardgrave
Statistical methods and their applicability to management. Topics include sampling, estimation, hypothesis testing, regression and analysis of variance. The student will learn how to utilize computer software packages in applying the statistical techniques. Prerequisite: Mgt 218 and 270 or equivalent.

276 **Managerial Statistics II** (3) Forman, Hahn, Hardgrave
Statistical modeling of management applications. Topics selected from multiple regression, analysis of variance, analysis of covariance, survey design and forecasting, factor analysis, and other multivariate methods. The student will learn how to utilize computer software packages for statistical modeling. Prerequisite: Mgt 275 or permission of instructor. (Spring)

290 **Special Topics in Management Science** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. Laboratory fee may be imposed, depending on requirements. (Fall or spring)

298 **Directed Readings and Research in Management Science** (3) Staff
(Fall and spring)

299 **Thesis Seminar** (3) Staff
(Fall and spring)

300 **Thesis Research** (3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. (Academic year)

328 **Seminar: Operations Research** (3) Hardgrave
Special topics and advanced applications in operations research, such as fuzzy set theory, catastrophe theory, or Markovian decision processes. May be repeated once for credit. Prerequisite: Mgt 223 or permission of instructor.

365 **Seminar in Cybernetics and General Systems Theory** (3) Umpleby
A review of major literature in the field: sources of general systems and cybernetics concepts in traditional fields; examination of recent advances and contemporary concepts; extension of existing theory into new areas. Emphasis on relevance of concepts to organization management and institutional design.

366 **Managing Institutional Transformation in the Microchip Era** (3) Ericson
(Formerly Philosophic and Policy Issues in Institutional Articulation)
Modern microchip technologies have created institutional disparities

and discontinuities. General systems and cybernetic concepts provide an essential framework for guiding institutional transformation. Topics include: origins of human values; sources of institutional change; problems in institutional articulation; potential impacts of microchip technologies on sociocultural, political, and economic structures and processes; general systems, cybernetics, and managed institutional evolution. Prerequisite: Mgt 365.

390 **Philosophical Foundations of Administrative Research** (3) Vaill
Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology, and empirical data. (Fall and spring)

391 **Methodological Foundations of Administrative Research** (3) Umpleby
Examination of the process of social science research. Use of models and theoretical frameworks in research: formulation of research questions, hypotheses, operational definitions, research design, sampling methods, and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Spring)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
May be repeated for credit. (Fall and spring)

MATHEMATICS

Professors D. Nelson, T.P.G. Liverman *(Chairman)*, H. Kenyon, C. Taam, R.L.A. Bari, I. Katz, H.D. Junghenn
Adjunct Professor J. Eftis
Professorial Lecturer C.M. Chambers
Associate Professors I.I. Glick, M.D. Green, M.P. Lee, E.A. Stone, M.M. Gupta
Associate Professorial Lecturers Y. Akiyama, A. Heidrich
Assistant Professorial Lecturers P. Echeverria, K.E. Eickman
Lecturers S. Dillman, T.F. Wolfinger

Bachelor of Arts or Bachelor of Science with a major in mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139 and 140. It is also strongly recommended that students take French, German, or Russian, and mathematically related courses in such subjects as physics, statistics, economics and engineering.
4. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

Bachelor of Arts or Bachelor of Science with a major in applied mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)

3. Required courses in related areas:

(a) Stat 189–90.

(b) Eighteen semester hours to be selected, in consultation with the department advisor, from social and management sciences, engineering and physical sciences, or computer sciences. At least 12 semester hours must be chosen from one area, and at least six semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil engineering, electrical engineering and computer science, engineering administration, mechanical engineering, and operations research, see the *School of Engineering and Applied Science Bulletin*.

4. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 111, 112, 139, 140, 181–82. It is also strongly recommended that students take French, German, or Russian.

5. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

Master of Arts in the field of mathematics—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 30 semester hours of approved course work, with or without a thesis, and must pass a comprehensive examination.

Master of Arts or Master of Science in the field of applied mathematics—Prerequisite: a bachelor's degree with a major in mathematics or a related field such as statistics, a physical science, engineering, or economics.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, computer science, electrical, engineering administration, mechanical, or operations research), physics, statistics, or urban and regional planning. Courses in the chosen area of application are selected in consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, including Math 299–300 *Thesis Research*, and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 hours of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the department of mathematics and the department concerned with the area of application.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than six semester hours from second-group courses. There is no thesis requirement.

Master of Science for Teachers—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31; experience in teaching mathematics at the secondary school level.

Required: 30 semester hours of approved second- or third-group mathematics courses, including Math 168.

Doctor of Philosophy in the field of mathematics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The department doctoral program committee, after consultation with the student, will stipulate (1) courses that must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from

French, German, or Russian, which must satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the following research fields for the dissertation: functional analysis (abstract differential equations, functional equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, ordinary and partial differential equations, theory of numbers, and topology (general topology, analytic topology, topological groups).

Bachelor of Arts in Education and Human Development with a teaching field in mathematics—Prerequisite: the education curriculum; required: the mathematics option and the professional courses stated under the School of Education and Human Development.

First Group

***3 College Algebra** (3) **Katz and Staff**
Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

***6 Plane Trigonometry** (3) Katz and Staff
Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor). (Fall and spring)

***9 General Mathematics I** (3) Nelson and Staff
Logic, sets, foundations of the number system, abstract mathematical systems, groups. (Fall and spring)

***10 General Mathematics II** (3) Nelson and Staff
Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices. (Fall and spring)

30 Precalculus (3) **Bari and Staff**
Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

31 **Single-Variable Calculus I** (3) Kenyon and Staff
Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and spring)

32 **Single-Variable Calculus II** (3) Kenyon and Staff
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31. (Fall and spring)

33 **Multivariable Calculus** (3) Kenyon and Staff
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

37 **Computer Programming with Calculus** (3) Gupta
Computer programming in conjunction with calculus, leading to a

* The School of Government and Business Administration does not accept credit for this course toward the B.B.A.

better appreciation of basic concepts, especially infinity and infinitesimals. Fundamentals of FORTRAN, limits of functions and quotients, derivatives as limits of quotients. Increments and differentials (e.g., volumes as functions of radii); rates of change, indeterminate forms; definite integrals; trapezoidal rule; areas and volumes. Prerequisite: Math 31 or equivalent, or permission of instructor.

41 Calculus for Economists I (4) Junghenn
Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent.* (Fall and spring)

42 Calculus for Economists II (4) Junghenn
Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Fall and spring)

†51 Mathematics for the Social and Management Sciences I (3) Glick and Staff
Solution of systems of linear equations; notion of function; graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

†52 Mathematics for the Social and Management Sciences II (3) Glick and Staff
Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; matrix algebra, linear programming; difference equations and mathematics of finance. Prerequisite: Math 51. (Fall and spring)

Second Group

101 Introduction to Mathematical Logic (3) Nelson
Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall)

102 Axiomatic Set Theory (3) Nelson
Zermelo-Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor. (Spring, odd years, when demand warrants)

104 Mathematics and Human Thought (3) Staff
Philosophical and historical aspects of mathematics and its interplay with other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Spring, even years, when demand warrants)

106 Introduction to Topology (3) Kenyon and Staff
Prerequisite: Math 139 or permission of instructor. (Spring)

107 Introduction to Algebraic Topology (3) Bari
Prerequisite: Math 122 and 139, or permission of instruction. (Fall, even years, when demand warrants)

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* Math 30 may be waived as a prerequisite by examination on scheduled dates.
† Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52. Economics students are advised to take Math 41 and 42.

111 **Mathematics for Engineers and Physicists I** (3) Stone and Staff
Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)

112 **Mathematics for Engineers and Physicists II** (3) Stone and Staff
Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)

113 **Graph Theory** (3) **Bari**
Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 **Introduction to Abstract Algebra** (3–3) Katz
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 **Linear Algebra** (3) Lee
Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. (Fall)

124 **Introduction to Matrix Theory** (3) Liverman and Staff
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42 or permission of instructor. (Fall and spring)

125 **Linear Programming** (3) **Katz**
Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)

134 **Introduction to Boundary-value Problems** (3) Gupta and Staff
Prerequisite: Math 111 or 142. (Spring, even years)

135 **Projective Geometry** (3) Staff
Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)

139 **Advanced Calculus I** (3) Junghenn, Taam
Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 **Advanced Calculus II** (3) Junghenn, Taam
Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

141 **Advanced Calculus III** (3) Glick and Staff
Tensors, differential forms, Stokes theorem, introductory differential geometry. Prerequisite: Math 140. (Spring, even years, when demand warrants)

142 **Introduction to Differential Equations** (3) Taam and Staff
Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Fall)

153 **Introduction to Numerical Analysis I** (3) Gupta
Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices.

Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)

154 **Introduction to Numerical Analysis II** (3) Gupta
Numerical differentiation and integration. Solution of ordinary differential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite: Math 153 or permission of instructor. (Spring, odd years)

157 **Introduction to Complex Variable Theory** (3) Liverman and Staff
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

168 **Seminar: Curriculum Studies** (3) **Bari and Staff**
Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite: Math 31 and permission of instructor. (Offered when demand warrants)

181–82 **Seminar: Applied Mathematics** (3–3) Glick and Staff
Prerequisite: Math 140, Stat 189-90, some knowledge of linear algebra, senior status as major in Applied Mathematics. (Academic year)

191 **Special Topics** (arr.) **Staff**
Admission by permission of instructor. May be repeated for credit. Offered upon demand.

195 **Reading and Research** (arr.) **Staff**
Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit. (Fall or spring)

Third Group

Courses marked with an asterisk (*) are offered every year. Courses listed by title alone are offered when, and with such contents, as demand warrants.

ALGEBRA

201–2 **Modern Algebra I and II** (3–3) Katz, Lee
Fundamental concepts of groups, rings, and fields. (Academic year)

203 **Modern Algebra III** (3) **Lee**

204 **Representation Theory** (3) **Lee**

205 **Matrix Theory** (3) **Katz**

206 **Topics in Algebra** (3) **Staff**

ANALYSIS AND APPLIED MATHEMATICS

*211 **Complex Analysis I** (3) Liverman and Staff
Topology of complex numbers; elementary functions; integrals: Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Fall)

212 **Complex Analysis II** (3) Junghenn and Staff
Harmonic functions, partial fractions. Mittag-Leffler theorem; entire functions, the Hadamard product theorem, the gamma function; Hurwitz's theorem, normal families of functions. The Riemann map-

ping theorem; analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent. (Spring, even years, when demand warrants)

213 **Applications of Complex Analysis** (3) Liverman and Staff
Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions: steepest descent, stationary phase, and WKB methods. Fourier and Laplace transforms, Wiener-Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables. (Spring, odd years, when demand warrants)

*214 **Measure and Integration Theory** (3) Junghenn and Staff
Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon-Nikodym theorem; measure on product spaces; Fubini theorem. L^p spaces. Prerequisite: advanced calculus. (Spring)

*215 **Introduction to Functional Analysis** (3) Taam
Topological and metric spaces; Tychonoff theorem; completion of a metric space; Normed and Banach spaces; linear functionals and operators; Hahn-Banach theorem; principle of uniform boundedness; the closed-graph theorem and interior mapping principle; Hilbert spaces; eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: advanced calculus. (Fall)

216 **Banach Algebras and Special Theory of Operators** (3) Taam
Gelfand theory of commutative Banach algebras; function algebras, Stone-Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone-Weierstrass theorem. (Spring, odd years, when demand warrants)

217 **Introduction to Ordinary Differential Equations** (3) Glick and Staff
First course in ordinary differential equations; existence and uniqueness of solutions; continuity of solutions with respect to initial conditions; properties of linear systems. Prerequisite: advanced calculus. (Fall, even years, when demand warrants)

218 **Topics in Ordinary Differential Equations** (3) Staff

219 **Partial Differential Equations** (3) Liverman
Classical and modern techniques for the exact and approximate solution of P.D.E.s. Separation of variables, Green's functions, variational methods, Hilbert space methods. Prerequisite: advanced calculus. (Spring, odd years, when demand warrants)

220 **Topics in Partial Differential Equations** (3) Liverman

221 **Calculus of Variations** (3) Glick

222 **Introduction to Numerical Analysis** (3) Gupta
Computer arithmetic and round-off errors. Solution of linear systems and nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Eigenvalues and eigenvectors. Prerequisite: knowledge of advanced calculus and computer programming. (Fall, odd years)

223 **Numerical Solution of Ordinary and Partial Differential Equations** (3) Gupta
Initial and boundary value problems for ordinary differential equations. Error propagation, convergence and stability. Finite difference and finite element methods for partial differential equations. Prerequisite: knowledge of differential equations and computer programming. (Spring, even years)

224 **Generalized Functions and Operational Methods** (3) Liverman
225 **Theory of Generalized Functions and Distributions** (3) Liverman
226 **Control Theory** (3) Glick
227–28 **Introduction to System Theory** (3–3) Staff
229 **Mathematical Programming** (3) Katz
230 **Topics in Analysis** (3) Staff
231 **Topics in Applied Mathematics** (3) Staff
232 **Topics in Numerical Analysis** (3) Gupta
241–42 **Mathematical Foundations of Stochastic Processes** (3–3) Junghenn

COMBINATORIAL MATHEMATICS

261 **Combinatorics** (3) **Bari**
Generating functions, recurrence relations, counting theorems. Selected topics. Applications to statistical mechanics, information theory, design of experiments, operations research, linear and dynamic programming, network theory. Prerequisite: undergraduate modern algebra and linear algebra. (Spring, odd years)

262 **Graph Theory** (3) **Bari**
Electrical and other networks, matroids, chemical isomers, crystal structure, linear programming, operations research, Markov chains, Feynman diagrams, selected topics in graph theory from introductory topics to problems currently of research interest. (Spring, even years)

263 **Topics in Combinatorial Mathematics** (3) **Staff**

LOGIC

271 **Introduction to Mathematical Logic** (3) Nelson
Propositional and predicate calculus (first order): syntax, formation rules, semantics, axioms, proof and deduction, object vs. metalanguage, deduction theorem, compactness theorem, Gödel-Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic: incompleteness and undecidability. (Fall, odd years)

272 **Topics in Logic (3)** **Nelson**

TOPOLOGY

281–82 **General Topology** (3–3) Kenyon and Staff
General topological spaces, separation axioms, compactness and connectedness. Metrization, uniform spaces, and complete spaces. (Academic year)

283–84 **Topological Groups** (3–3) Green
285 **Topological Vector Spaces** (3) Junghenn
287 **Differentiable Manifolds I** (3) Glick
Differentiable manifolds, tangent vectors, sub-manifolds, imbeddings and immersions, vector fields and differential equations on manifolds, tensors and differential forms, Lie derivatives, orientability. (Spring)

288 **Differentiable Manifolds II** (3) Glick
Manifolds with boundary, integration on manifolds, Stokes' theorem and the divergence theorem, the Brouwer fixed-point theorem, de-Rham groups, Riemannian manifolds, geodesics, curvature. (Fall, even years, when demand warrants)

289 **Topics in Topology** (3) **Staff**

RESEARCH

*295 **Reading and Research** (3) **Staff**
May be repeated once for credit. (Fall and spring)

Fourth Group

*398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

*399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MICROBIOLOGY—GRADUATE PROGRAMS

Professors R. Hugh, L.F. Affronti *(Chairman)*, K. Huang, M. Reich, P.D. Kind

Master of Science in the field of microbiology—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11–12; Chem 11–12, 151–52, 153–54; Math 30, 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. A total of 30 semester hours is required, 24 hours of course work and six hours of thesis (Micr 299–300). The course work must include Micr 211 (if not taken prior to admission), plus Bioc 221–22; Micr 277–78; and completion of the biostatistics tool requirement. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

Doctor of Philosophy in the field of microbiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. Candidates must fulfill the tool requirement by completing biostatistics and by either passing a reading knowledge examination in French or German, or completing satisfactorily six semester hours in an approved tool option such as electron microscopy. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: clinical microbiology, determinative bacteriology, mycology, immunology, microbial genetics, microbial physiology, and virology.

211 Microbiology (4) **Staff**
Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 **Pathogenic Bacteriology** (3) Hugh
Principles of pathogenic bacteriology. Isolation and identification of bacterial agents that cause diseases in humans. Pathogenic characteristics of bacteria. Prevention and control of bacterial diseases in humans. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

213 **Bacterial Pathogenesis** (3) Hugh
Development of bacterial diseases in humans. Prerequisite: Micr 212 or equivalent. (Fall)

214 **Tissue Cell Culture** (3) **Staff**
Fundamental aspects of tissue culture, with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures, emphasizing quality control practices. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Parasitology** (2) Turner*
Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 **Scientific Writing** (1) Wagner†
A basis for preparing theses, dissertations, and publications. (Fall)

225 **Microbial Physiology I** (3) Reich
Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221–22, Micr 211, or equivalent. (Fall)

226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly‡
The actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular level. Prerequisite: Micr 225 or permission of instructor. (Spring)

227 **Microbial Physiology Laboratory** (2) Reich
The application of laboratory techniques and instrumentation to topics covered in Micr 225 and 226. Prerequisite: Micr 226. Laboratory fee, $20. (Fall)

229 **Immunology** (3) Kind, Affronti
Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor. (Fall)

230 **Immunology Laboratory** (2) Kind, Affronti
Emphasis on methods in serology, immunochemistry, and cellular immunology that are used in research laboratories. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in a degree program. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind
Study of immunological functions of reticulo-endothelial tissues, theories of auto-immunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. For medical students; open to graduate students. Prerequisite: Micr 201§ or 229, and permission of instructor. (Fall)

233 **Virology** (3) Stokes
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Stokes
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall, odd years)

250 **Pathogenesis of Microbial Infections** (1) Hugh
Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and para-

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* Virginia M. Turner is Adjunct Assistant Professor of Parasitology in Microbiology in the G.W.U. School of Medicine and Health Sciences.
† Gerald Eugene Wagner is Assistant Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.
‡ Rosalie Frances De Giovanni-Donnelly is Associate Professorial Lecturer in Microbiology in the G.W.U. School of Medicine and Health Sciences.
§ For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*.

sitic infections in humans. Host and agent factors that specifically influence resistance to infection. For medical students, open to graduate students. Prerequisite: Micr 201 or 212 and 213. (Fall)

252 **Medical Parasitology** (1) Turner
Lecture and laboratory course. The life cycles, epidemiology, clinical manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections. In the laboratory, emphasis is placed on the recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens. For medical students; open to graduate students. (Fall)

255 **Clinical Virology** (1) Huang
General principles of virology; emphasis on clinical situations. For medical students; open to graduate students. Prerequisite: Micr 212 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti
Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221-22 or equivalent, Micr 229. Laboratory fee, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind
Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff
Required of graduate students. (Academic year)

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MUSEUM STUDIES—GRADUATE PROGRAM

Committee on Museum Studies
A.D. Andrews, R.L. Humphrey, M.P. Lader, B. Mergen, R.K. Packer, C.R. Rose, M.S. Shapiro *(Director)*

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of museum studies. This program provides students with a broad background in museum studies, including a variety of specialized approaches to museum work, with concentrations in museum administration, collections management/preventive conservation, and museum programs.

The Program is designed primarily to prepare students to work with historical and scientific collections. Students whose principal career interests are in art collections and galleries should apply for candidacy in the program for the Master of Arts in the field of art history with a concentration in museum training, offered by the Art Department. Students whose career interests are primarily in curatorial positions with ethnographic and archaeological materials should apply for candidacy for the Master of Arts in the field of anthropology, with a concentration in museum training. Students whose career interests are primarily in curatorial positions with historical materials should apply for candidacy for the Master of Arts in the field of American studies, with a concentration in museum training. Students whose career interests are in museum education should apply for candidacy in the program for the Master of Arts in Teaching—Museum Education, offered by the School of Education and Human Development.

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences, including a bachelor's degree with a major, or its equivalent, in anthropology, art history, American studies, or natural science. In addition, the student should have taken at least six credit hours in each of these fields and at least nine credit hours in one of them, other than the student's undergraduate major, or must show equivalent preparation.

The Committee on Museum Studies serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

Master of Arts in the field of museum studies—Required: the general requirements stated under the Graduate School of Arts and Sciences. The degree requires a minimum of 42 hours of course work. At least 15 hours of course work must be in an academic core discipline, for example, American studies, anthropology, biological sciences, geology and paleobiology, public administration, or an appropriate interdisciplinary combination. At least 15 hours of course work must be in museum studies courses in conservation, museum administration, and exhibiting. Six to 12 hours must be in a museum internship in the Washington area or elsewhere. The student must pass a comprehensive examination based on course work and submit a research paper of publishable quality. In addition, the student must fulfill the tool requirement by passing a reading examination in an approved foreign language, an approved course in statistics or computer programming, or other approved courses.

201 **Introduction to Museum Studies** (3) Shapiro
An introduction to the field and literature of museum studies. Topics include: types and varieties of museums; governance and organization; financial, human, and physical resources; collections management; conservation principles and practices; programs, exhibition, education; interpretation; research, publications, evaluation; ethics and professionalism.

216 **Collections Management in the Natural History Museum** (3) Collier, Russell
General principles of collections management—preservation, storage, maintenance, and documentation of natural science and anthropological specimens. Topics include storage hardware systems, environmental effects on collections, inventory control, registration systems, and data storage and retrieval. (Spring)

265 **The Small Museum: Selected Topics** (3)
Topics will vary. (Fall)

270 **Seminar: Museum Exhibiting** (3) Mahoney
Selected museum exhibiting problems in the social and natural sci-

ences, including methods and techniques of exhibition, problems of museum communication and education. Taught at the Smithsonian Institution. (Fall)

291 **Museum Internship** (3 or 6) Shapiro
Individual work experience and/or research experience in museums of the Washington area and possibly elsewhere. Each student should make arrangements with the Director. Museum internships are supervised by one (or more) member(s) of the cooperating museum staff in the area of museum management, conservation, exhibiting, etc. May be repeated for credit. (Fall, spring, summer)

295 **Directed Research** (3) Staff
Individual research on special topics of the museum field. Topics must be approved by the Director of Museum Studies. May be repeated for credit. (Fall, spring, summer)

297 **Special Topics in the Museum Field** (3) Staff
Topics may include Collections Management: Principles and Policies, Museum Accessibility for Handicapped Persons, and Accounting for Nonprofit Organizations. May be repeated for credit.

Related Museum Studies Courses Offered by Other Departments

CONSERVATION
Art/Anth 292: *Introduction to Conservation*
Art/Anth 293: *Preventive Conservation Techniques*
Art/Anth 212: *Advanced Conservation Techniques*
Anth 295: *Research*

ADMINISTRATION
Art 217–18: *Problems in Museum Work*

MUSEUM PROGRAMS
Art 209–10: *Exhibition and Display Design*
Anth 264: *Seminar: Museum Techniques*
Anth 291: *Anthropology in the Museum*
Educ 311: *Museum Audiences*

INTERNSHIPS
Art 201–2: *Museum Projects*
Art 271–72: *Museum Techniques*
Anth 290: *Advanced Museum Research*
AmCv 251: *Museum Research and Education*
Educ 312: *Internship in Museum Education*

MUSIC

Professors G. Steiner, R. Parris
Professorial Lecturer E. Meyers
Associate Professor N.A. Tilkens
Assistant Professors R.J. Guenther *(Chairman)*, C.J. Pickar
Adjunct Assistant Professors M.C. Tolson *(Piano)*, M. Garst *(Piano)*, J.E. White *(Voice)*, S.K. Kim *(Piano)*, J. Albertson *(Guitar)*, F.B. Conlon *(Piano)*
Assistant Professorial Lecturer B. Feinstein
Studio Instructors F. Cohen *(Opera)*, M. Findley *(Violin)*, P. Fischer *(Flute)*, K. Fleming *(Cello)*, P. Gieseler *(Voice)*, E. Guenther *(Organ)*, N.M. Irvine

(Bass), C.W. King *(Recorder)*, A. Lee *(Voice)*, L. Lipnick *(Bassoon)*, W.H. Mann *(Flute)*, M. McNabb *(Piano)*, R. Odmark *(French Horn)*, R.J. Pallansch *(Tuba)*, R. Parnas *(Violin and Viola)*, T. Perazzoli *(Flute)*, S. Prussing *(Voice)*, B.R. Seidman *(Harp)*, M. Sislen *(Guitar)*, S. Wellman *(Voice)*, R. White *(Oboe)*, W.R. Wright *(Clarinet and Saxophone)*, G. Recker *(Trumpet)*, P. Edgar *(Percussion)*, G. Cavallaro *(Guitar)*, A. Kopfstein *(Guitar)*

Bachelor of Arts with a major in music (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—Mus 2, 5 6, six hours of applied music lessons, a minimum of four semesters in music ensemble groups.

3. Required courses in related areas—12 hours of one foreign language (French, German, or Italian recommended).

4. Required courses in the major—Mus 101, 102, 103, 104, 131–32, 138, 151; six additional hours of applied music courses. Students preparing for graduate study or professional concentration in music may elect a further program of specialization in music literature, theory, or applied music. (Music theory majors must meet departmental requirements for proficiency in piano; applied music majors must perform a complete public recital or the equivalent in major solo performances.)

Bachelor of Music—Admission to the Bachelor of Music degree program requires demonstration of special advanced pre-admission training and aptitude. The 129-credit-hour program requires music courses as follows: Mus 2 and 9, 5–6, 101–2, 103–4, 131–32, 138–39, 151, 199; 6 hours of ensemble courses; 12 hours of other applied music courses; 15 hours of additional courses in the area of concentration; and 9 hours of electives. The general requirements consist of 45 hours of non-music courses, including 6 hours each of English composition, humanities, social science, and natural science courses, and 12 hours of a foreign language.

Master of Arts in the field of musicology—Prerequisite: a bachelor's degree with a major in music, or an equivalent degree. Applicants from other institutions must present scores on the Advanced Music Test of the Graduate Record Examinations.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 30 semester hours of course work including a thesis (six semester hours).

Master of Music in the field of music theory, music composition, conducting, or applied music—Prerequisite: a bachelor's degree with a major in music or an equivalent degree. Applicants from other institutions must present scores on the Advanced Music Test of the Graduate Record Examinations.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The required second- and third-group course work is as follows:

1. *In the field of music theory*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques.

2. *In the field of music composition*—Thirty semester hours of course work including a creative thesis of one composition in large form properly prepared for performance (chamber music, a symphonic form, or a choral work with orchestral accompaniment) including a theoretical, formal, and harmonic analysis of the work.

3. *In the field of conducting*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques. The requirements also include acceptable public conducting performances.

4. *In the field of applied music*—Thirty semester hours distributed as follows: (a) 12 semester hours of applied music in the area of concentration; (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (six semester hours). The thesis consists of a public recital and performance before a designated committee (such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level), and delivery of an historical and analytical lecture on the musical content of the program; demonstrated leadership in an ensemble performance (opera or oratorio for voice); and a written report on some approved theoretical area related to the student's concentration.

Bachelor of Arts in Education and Human Development with a teaching field in music—Prerequisite: the education curriculum; required: the music option and professional courses stated under the School of Education and Human Development.

MUSIC THEORY, HISTORY, AND LITERATURE

First Group

1 Elements of Music Theory (3) Guenther, Parris
Notation, scales, keys, intervals, terms, rhythms, and chord structure. (Fall and spring)

2 Ear-Training I (3) Pickar
Melodic and harmonic dictation, ear-training, sight-singing, elementary keyboard harmony. (Fall)

3 Introduction to Musical Understanding (3) Steiner, Tilkens
Introductory history of musical styles, related to listening; study of music materials and media. (Fall and spring)

4 Survey of Music Literature (3) Steiner
Introductory study of musical forms, structures, and textures; aural analysis of selected literature. (Spring)

5–6 Harmony (3–3) Parris
Triads, inversions; chord analysis, construction, and progression; part-writing, modulations, altered chords. Prerequisite: Mus 1 or satisfactory passing of placement examination. (Fall and spring)

7 Music of Nonwestern Cultures (3) Tilkens
Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa. (Fall)

8 History of Jazz (3) Staff
Introduction to the styles, composers, and performers of jazz music from its origins to the present. (Fall)

9 Ear-Training II (3) Pickar
(Spring)

Second Group

101–2 History of Music I (3–3) Tilkens
Development of music in the Western world from the early Christian era through the Baroque. (Academic year)

103–4 History of Music II (3–3) Tilkens
Development of Western music from the Classic period to the present. (Academic year)

109 Orchestra Literature (3) **Steiner**
Survey of the history and styles of orchestra literature, analysis of representative works. (Spring)

110 Chamber Music Literature (3) **Steiner**
Survey of the history and styles of chamber music literature, analysis of representative works.

121 The Opera (3) **Feinstein**
Survey of the history and styles of opera, analysis of representative works. (Fall)

125 Keyboard Music Literature (3) **Tilkens**
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present.

131–32 Advanced Theory (3–3) **Parris**
Practice in 18th-century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent. (Academic year)

133–34 Composition (3–3) **Parris**
(Academic year)

135 Counterpoint (3) **Parris**
Study and practice of 16th-century contrapuntal techniques. (Spring)

137 Orchestration (3) **Parris**
Instrumental scoring. (Fall)

138–39 Form and Analysis (3–3) **Parris**
Analysis of musical forms in representative musical literature. (Academic year)

151 Conducting (3) **Steiner**
Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Fall)

160–61 Electronic Music (3–3) **Meyers**
Tape and electronic techniques, synthesizer use, and acoustical principles. (Academic year)

173 Pedagogy (3) **Steiner**
Principles, materials, and methods of teaching in a selected area. See *Schedule of Classes* for specific area. (Spring)

199 Independent Research (3) **Staff**
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

Third Group

203 Bibliography and Research Methodology (3) **Guenther**
(Fall)

205 Music of the Baroque Period (3) **Tilkens**
Study of the musical styles, techniques, and literature from 1600 to 1750.

206 Music of the Classic Period (3) **Tilkens**
Study of styles, techniques, and literature from the 18th-century schools through Haydn, Mozart, and Beethoven. (Spring)

207 Music of the Romantic Period (3) **Guenther**
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century. (Spring)

208 Music of the 20th Century (3) **Steiner**
The principal schools, techniques, developments, and trends of the 20th century.

231–32 **Composition** (3–3) — Parris
May be repeated for credit. (Academic year)

234 **Seminar: Performance Practices in Selected Areas** (3) — Staff

237 **Seminar: Analytical Studies in Music Theory** (3) — Guenther
(Fall)

238 **Seminar: Analytical Studies in Music History** (3) — Tilkens, Guenther
Fall: Brahms; spring: Mahler.

239 **Independent Research** (3) — Staff

251–52 **Advanced Conducting** (3–3) — Steiner
(Academic year)

299–300 **Thesis Research** (3–3) — Staff
(Fall and spring)

APPLIED MUSIC

All applied music courses are offered both fall and spring, and may be repeated for credit.

Mus 51, 52, 53, 54, 55 and 153 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.
2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, $150.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Supplementary fees are different for courses offered during the summer sessions. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors.

First Group

Required practice: three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

11 Piano (1)
12 Piano (2) — Staff

13 Voice (1)
14 Voice (2) — Staff

15 Organ (1)
16 Organ (2) — E. Guenther

17 Violin (1)
18 Violin (2) — Staff

19 Classical Guitar (1)
20 Classical Guitar (2) — Staff

21 Viola (1)
22 Viola (2) — Parnas

23 Cello (1)
24 Cello (2) — Fleming

25 Bass (1)
26 Bass (2) — Irvine

27 Flute (1)
28 Flute (2) — Staff

29 **Recorder** (1) — King
30 **Recorder** (2)
31 **Oboe** (1) — R. White
32 **Oboe** (2)
33 **Clarinet** (1) — Wright
34 **Clarinet** (2)
35 **Saxophone** (1) — Wright
36 **Saxophone** (2)
37 **Bassoon** (1) — Lipnick
38 **Bassoon** (2)
39 **French Horn** (1) — Odmark
40 **French Horn** (2)
41 **Trumpet** (1) — Recker
42 **Trumpet** (2)
43 **Trombone** (1) — R. Guenther
44 **Trombone** (2)
45 **Percussion** (1) — Edgar
46 **Percussion** (2)
47 **Harp** (1) — Seidman
48 **Harp** (2)
49 **Tuba** (1) — Pallansch
50 **Tuba** (2)

51 **Orchestra** (1) — Staff
Preparation and performance of orchestral literature. Prerequisite: audition before director. (Fall and spring)

52 **Instrumental Ensemble** (1) — Steiner
Chamber ensemble groups approved by audition. (Fall and spring)

53 **Glee Club** (1) — Pickar
Preparation and performance of choral literature. Prerequisite: audition before director. (Fall and spring)

54 **Chamber Choir** (1) — Pickar
Small vocal groups and chorus participation. Prerequisite: audition before director. (Fall and spring)

55 **Band** (1) — Wright
Concert band, stage band and brass ensemble. (Fall and spring)

Second Group

Departmental prerequisite: audition to meet departmental requirements.

Required practice: six hours a week for one-semester-hour courses and 12 hours a week for three-semester-hour courses. In addition, three-semester-hour courses include master performance classes and recital preparation.

111 **Piano** (1) — Staff
112 **Piano** (3)
113 **Voice** (1) — Staff
114 **Voice** (3)
115 **Organ** (1) — Staff
116 **Organ** (3)
117 **Orchestral Instrument** (1) — Staff
118 **Orchestral Instrument** (3)
119 **Classical Guitar** (1) — Staff
120 **Classical Guitar** (3)

153 **Opera Workshop** (1) — Staff
Preparation and dramatic performance of operatic literature. Prerequisite: audition before director. (Fall and spring)

Third Group

All courses include supervised ensemble preparation and required concert solo performances.

211 Piano (3)
213 Voice (3)
215 Organ (3)
217 Orchestral Instrument (3)

OCEANOGRAPHY

See **Geography and Regional Science.**

PATHOLOGY—GRADUATE PROGRAM

Professors H. Sidransky *(Chairman)*, F.N. Miller, S. Bloom
Associate Professors S.G. Kent, B.C. Zook *(Comparative)*, Y. Al-Doory, C.T. Garrett, J.M. Orenstein
Assistant Professor A.M. Schwartz

Programs of study leading to the degree of *Associate in Science (Medical Laboratory Technique)* are described in the *School of Medicine and Health Sciences Bulletin.*

Doctor of Philosophy in the field of pathology—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases, applicants with other backgrounds in the life sciences may be accepted.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 283, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

Research fields: comparative pathology, human pathology, ophthalmic pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

203–4 Pathology (4–4) **Staff**
General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

220 Medical Mycology (2) Al-Doory
Lecture and laboratory course covering pathogenic fungi, mycotic diseases, and their clinical aspects. (Fall)

222 Opportunistic Mycoses (2) Al-Doory
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

256 **Pathology of Infectious Diseases** (3) Abraham*
Correlation of clinical, physiologic, immunologic, and pathologic mechanisms determining the course and morphological changes which occur in infections. Analysis of human case material and review of assigned selected readings. Prerequisite: Micr 211 and Path 203.

257 **Transmission Electron Microscopy in Pathologic Diagnosis** (3) Orenstein, Abraham
Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203, 204; Anat 260, 261.

258 **Organ System Pathology** (5) Bloom
Gross and microscopic study of human pathologic material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203, 204, and permission of instructor. (Fall and spring)

276 **Seminar in Experimental Pathology** (1) Staff
Presentations on current topics in experimental pathology. (Fall and spring)

283 **Anatomic Pathology Clerkship** (arr.) Staff
Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

286 **Perinatal Pathology** (arr.) Kent
Course will focus on the important disorders that may beset the human fetus and the newborn infant. Emphasis on the role of placental abnormalities. Prerequisite: Path 203 or equivalent. (Spring)

295 **Comparative Pathology** (arr.) Zook, Montali†
Participation in veterinary pathology service, including studies of domestic, wild, and laboratory animals. Review of training materials and participation in training sessions. Graduate students receive five semester hours of credit for each four-week full-time period. Prerequisite: Path 203–4.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHARMACOLOGY

Professors H.G. Mandel *(Chairman)*, V.H. Cohn, P. Mazel, J.A. Straw, P. Klubes, F.P. Abramson

* Andreas Andrew Abraham is Associate Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

† Richard J. Montali is Adjunct Associate Professor of Pathology (Comparative Pathology) at the G.W.U. School of Medicine and Health Sciences.

Professorial Lecturer J. Axelrod
Associate Professor R.J. Anderson
Assistant Professor B.L. Bean

Master of Science in the field of pharmacology—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Phys 1, 2; Math 31, 32; Chem 11–12, 22, 151–52, 153–54. A course in physical chemistry is also recommended.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22; Phyl 201, 212; Phar 203, 205, 299–300.

Doctor of Philosophy in the field of pharmacology—Required: the general requirements stated under the Graduate School of Arts and Sciences.

Research fields: biochemical pharmacology and toxicology, cancer chemotherapy, developmental pharmacology and toxicology, endocrine pharmacology, molecular pharmacology, neuropharmacology, neurotoxicology, genetic toxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and physiological disposition of drugs.

Second Group

114 **Drugs and the Consumer** (3) Cohn and Staff
General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus tradename drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn
Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring)

158 **Drugs and Their Actions** (2) Klubes and Staff
Introductory pharmacology course. Drugs, the basis of their therapeutic and toxic actions and their fate in the body. Admission by permission of the instructor. (Spring)

Third Group

203 **Fundamental Principles of Pharmacology and Toxicology** (3) Cohn and Staff
Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of the instructor. (Fall)

205 **Pharmacology** (8) Cohn and Staff
Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite:

Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

207 **Cardiovascular Pharmacology** (2) Bean and Staff
Physiology and pharmacology of cardiovascular diseases, hypertension, heart failure, coronary artery disease, arrhythmia. Mechanism of action of drugs used in the treatment of cardiovascular diseases. Prerequisite: Phyl 201 and Phar 201, 203, or 205. (Spring)

215 **Adolescent Drug Abuse** (3) Cohn and Staff
Offered off campus primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

220 **Molecular Events in Toxic Actions** (2) Staff
Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 **Genetic Toxicology** (2) Williams* and Staff
The action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo*, and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Fall)

224 **Developmental Toxicology** (2) Staff
The effects of exogenous agents on the processes of reproduction and development and their mechanisms of action. Toxic effects on the gametes, embryo, fetus, and neonate. Prerequisite or concurrent registration: Phar 203, 205. (Spring)

226 **Neurotoxicology** (2) Anderson
Mechanisms by which chemicals produce toxic effects on nervous tissue at the subcellular, systemic, and behavioral levels. Effects of chronic and acute exposure. Prerequisite or concurrent registration: Phar 203, 205. (Spring, odd years)

230 **Special Topics in Toxicology** (arr.) Staff
Selected aspects of toxicology. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Abramson and Staff
Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

259 **Readings: Cancer Chemotherapy** (2) Klubes and Staff
Selected readings and discussion of recent advances in cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years)

260 **Endocrine Pharmacology** (1) Staff
Lectures and seminars on recent advances in the pharmacology and mechanisms of action of various hormones. (Spring, odd years)

269 **Pharmacology Seminar** (1) Mandel
Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall)

* Jerry Randall Williams is Research Professor of Radiology and of Pharmacology in the G.W.U. School of Medicine and Health Sciences.

272 **Physiological Disposition of Drugs** (3) **Cohn**
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes are studied through extensive reading of classical and current original literature. Prerequisite: Bioc 221–22, Phar 203, or permission of the instructor. (Spring)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff
A description of compartmental and physiological models of drug disposition. Problem-solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I-II** (1–1) Kennedy* and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III-IV** (1–1) Kennedy* and Staff
Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) **Staff**
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Anderson and Staff
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring)

295 **Reading and Research** (arr.) **Staff**
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHILOSOPHY

University Professor P.J. Caws
Professors T.Z. Lavine, R.H. Schlagel, R.S. French
Associate Professors W.B. Griffith *(Chairman)*, R.P. Churchill
Assistant Professor J.D. Moreno

Bachelor of Arts with a major in philosophy (departmental)—The following requirements must be fulfilled:

* Katherine Ash Kennedy is Assistant Professor of Pharmacology in the G.W.U. School of Medicine and Health Sciences.

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Required courses in related areas—six semester hours of literature courses selected from Chinese, Classics, English, French, German, Italian, Slavic, or Spanish (Clas 71, 72, or Engl 191-92 recommended); six hours selected from art history, music history, or religion; six hours in history (Hist 39–40 recommended).

3. Required courses in the major—a minimum of 30 semester hours, including Phil 111, 112, 113; 9 semester hours selected from Phil 121, 127, 151, 152; 6 semester hours selected from Phil 131, 132, 162; 6 semester hours selected from Phil 172, 192, 193. Recommended electives: Phil 142, 194, 197, plus graduate seminars open to seniors.

For students expecting to continue in graduate school, it is recommended that they include in their program of study 12 semester hours of introductory French, German, or Greek language courses.

Minor in philosophy—Required: a minimum of 18 semester hours, including 6 hours selected from Phil 111, 112, 113 without Phil 50, or 3 hours selected from the same group of courses with Phil 50, plus 12 hours of elective philosophy courses.

Master of Arts in the field of public policy with a concentration in philosophy and social policy—An interdisciplinary program which brings the normative, historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Two options are available at the discretion of the faculty: (1) a minimum of 24 semester hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester hours of graduate course work which does not include a thesis. All students are required to take four courses selected from the following: Phil 198, 231, 242, 271, 272; and, for the public policy core, four courses selected from: Stat 111, 183; Econ 217; PSc 203; Psyc 244; CSci 100 (*Introduction to Computer Science*). Phil 205 is open to all students; it is required of those with insufficient background in philosophy, as determined by the department. Phil 299–300 is required for students electing to write a thesis. Each candidate must pass a Master's Comprehensive Examination based on the particular interdisciplinary composition of the student's program of study. Prospective candidates should consult Professor Roderick French, director of the program.

First Group

45 Introduction to Logic (3) — **Churchill**
Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Spring)

50 Introduction to Philosophy (3) — **Staff**
Readings from major philosophers and study of philosophic positions from Plato to Sartre. (Fall and spring)

71 Philosophy and Literature (3) — **Lavine**
Philosophical foundations of psychoanalytical psychiatry, existentialism, and Marxism and their expression in literature, e.g., in the works of Mann, Kafka, Camus, Sartre, Hesse, Gide, and Koestler. (Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

111 **History of Ancient Philosophy** (3) Churchill
History of Western philosophy from early Greece to the early Middle ages. (Fall)

112 **History of Modern Philosophy** (3) Churchill
History of Western philosophy of the 17th and 18th centuries (Descartes to Kant). (Spring)

113 **19th-Century Philosophy** (3) Lavine
European philosophy from the Enlightenment and Kant to German Romanticism, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche. (Fall)

121 **Symbolic Logic** (3) Griffith
Formal evaluation of deductive arguments in politics, law, economics, etc. Additional topics: metatheory of deductive systems; modal logics; logic and computers. Prerequisite: a course in propositional logic or permission of instructor. (Fall)

127 **Theories of History** (3) Lavine
Major philosophies of history: Judeo-Christian, linear progressive, historicist, Hegelian-Marxian dialectical, cyclical (Vico, Spengler, Toynbee), and social-scientific (Comte, Weber). Contemporary problems of historical knowledge. Same as Hist 127. (Fall)

131 **Ethics** (3) Griffith
Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Spring)

132 **Social Philosophy** (3) Lavine
Social philosophies from Locke to the Frankfort School, Habermas, and Western Marxism. (Spring)

133 **Philosophy, Nonviolence, and the Problem of War** (3) Churchill
Problems of war in relation to morality; theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war. (Summer)

142 **Philosophy of Law** (3) Churchill
Systematic examination of fundamental concepts of law and jurisprudence; special emphasis on the relationship between law and morality. (Fall)

151 **Myth, Science, and the Modern Mind** (3) Schlagel
An overview of the growth of scientific rationalism from its origin in mythopoetic thought to the present, with emphasis on conceptual and methodological developments and the nature of scientific revolutions. Comparison of the cosmological frameworks of Aristotle, Newton, Einstein, and Bohr. (Fall)

152 **Knowledge, Truth, and Reality** (3) Schlagel
Inquiry into the basis and structure of knowledge, the problem of perception and independent reality, the role of language in knowledge, and the meaning and criteria of truth. (Spring)

* An interdepartmental course offered by the Philosophy, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion Departments.

162 **Aesthetics** (3) **Moreno**
Nature of aesthetic experience as related to artistic appreciation, criticism, and creation; artistic representation as a kind of systematic symbolization. (Spring)

172 **American Philosophy** (3) Moreno
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Fall)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300–1800)
Same as Engl/Fren/Ger/Hist/Rel 183 and Art 187.

185 **Ethical Issues in Policy Analysis** (3) Griffith
Ethical appraisal of normative policy arguments: cases from current controversies such as affirmative action programs, campaign contribution limitations, and regulation of worker health and safety. (Spring)

192 **Analytical Philosophy** (3) Moreno
The two dominant movements of recent Anglo-American philosophy, logical positivism and British ordinary language philosophy, as represented by Russell, G. E. Moore, Wittgenstein, Ryle, Ayer, etc. (Fall)

193 **Phenomenology and Existentialism** (3) Caws
Kierkegaard's existentialist reaction to Hegel; subjectivity and intentionality in 19th-century thought, leading to Husserl's phenomenology; the philosophy of existence in Heidegger and Sartre; the relation between existentialism and Marxism in the later work of Sartre. (Spring)

194 **Structuralism and Hermeneutics** (3) Caws
Structuralism in linguistics (since Saussure), anthropology (Lévi-Strauss), and literary criticism (Barthes and others) and its implication for philosophy (Foucault). The movement will be assessed in relation to other contemporary philosophical trends, especially the hermeneutics of Gadamer and Ricoeur. (Fall)

197 **Contemporary Ideologies and Utopias** (3) Lavine
A philosophic analysis of recent ideologies and utopias in Europe, the United States, and Asia: the sociological, psychological, political and intellectual origins of ideologies; their theoretical structure and their practical functions; the relation of ideologies to social change; the significance of the diffusion of ideologies to other cultures; ideologies and the problem of value-relativity. (Fall)

198 **Philosophy of the Social Sciences** (3) Lavine
Philosophic issues relating to theory, methodology, and application of the social sciences. Analysis of mainstream positivism, behaviorism, action theory, reality construction, phenomenology, ethnomethodology, sociology of knowledge and ideology, critical theory, and one major contemporary social scientific project. (Spring)

199 **Readings and Research** (3) **Staff**
(Fall and spring)

Third Group

201–2 **Readings and Research** (3–3) **Staff**
Advanced readings and reports. Investigation of special problems. (Academic year)

205 **Selected Schools and Problems** (3) **Staff**
An advanced review of the rise of modern empiricism, idealism, and

pragmatism, with particular attention to controversies regarding problems of method, epistemology, and social and political theory. Recommended for graduate students who have majored in fields other than philosophy. (Fall)

216 **Seminar: Kant** (3) **Schlagel**
Critique of Pure Reason.

231 **Ethics and Economic Policy: Justice and Equality** (3) **Griffith**
Ethical and economic analysis of equity and efficiency of current U.S. income distribution patterns. Theories of justice; economic theories of distribution; assessment of redistribution policies. Prerequisite: permission of instructor. (Fall)

235 **Ethics and Business** (3) Griffith
Concepts and strategies of ethical analysis applied to specific business problems, e.g., risk management, plant relocation, preferential hiring, political advertising; development of theory of corporate social responsibility. (Spring)

242 **Philosophy, Law, and Social Reform** (3) Churchill
A philosophical investigation of moral and legal rights in the American tradition, the importance of claims of right and entitlement in policy issues, and the ways legal institutions define specific rights by limiting or giving effect to our duties and liberties. (Spring)

251 **Seminar: Philosophy of Science** (3) **Schlagel**
Selected topics.

252 **Seminar: Epistemology** (3) **Schlagel**
Critical examination of selected problems or theories of knowledge. (Fall)

271 **Mankind and Nature in Public Policy** (3) **French**
Relation of philosophical conceptions of man and nature to national policies of growth and development in selected periods of American history. (Fall)

272 **American Philosophy and Mental Health Policy** (3) Moreno
Analysis and application of philosophical modalities to conceptual problems in mental health care as related to the construction of a social policy. (Spring)

299–300 **Thesis Research** (3–3) **Staff**

PHYSICAL SCIENCE

See Chemistry.

PHYSICS

Professors H.H. Hobbs, J. Eisenstein, O. Bergmann, A.J. Zuchelli, F. Prats *(Chairman)*, D.R. Lehman
Adjunct Professor L.C. Maximon
Associate Professors W.C. Parke, N.K. Khatcheressian, M.F. Taragin, E.P. Harper
Associate Professorial Lecturers J.J. Coyne, N. Khelil, R. Eaton III, M.T. Shams, W.D. Lee, J.W. Lightbody
Assistant Professors J.R. Peverley, W.J. Briscoe, P. Durgapal *(Visiting)*
Assistant Professorial Lecturers M.I. Haftel, J.T. Broach
Lecturer M. Lutzky

Bachelor of Arts with a major in physics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 13, 14, 15, 16; Chem 11–12; Math 31, 32, 33.
3. Required courses in related area—Stat 107 or EE 51; Math 111–12.
4. Required courses in the major—Phys 151–52, 161, 162, 163, 164, 165–66, 167, 168, 195.

Bachelor of Science with a major in physics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 1, 2, 14, 15, 16; Chem 11–12; Math 31, 32, 33.
3. Required courses in related area—Stat 197 or CSci 100; Math 111–12.
4. Required courses in the major—Phys 106, 127–28, 151–52, 163, 164, 195–96; plus one of the following: Phys 161, 165, 167.

Minor in physics—Required: Phys 3, 14, 15, 16; Phys 163 and 164 or approved substitutes from 100-level physics courses.

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

1. The Master's degree program *with* thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 30 semester hours of course work in physics, including Phys 211, 212, 213–14, 221–22, 233, 299–300; plus one of the following: Phys 224, 225–26, 231, 243, 244.

2. The Master's degree program *without* thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work in physics and mathematics including Phys 211, 212, 213–14, 221–22, 233; plus one of the following: Phys 224, 225–26, 231, 243, 244.

A reading knowledge of a foreign language, or the successful completion of Stat 197, with a grade of *A* or *B* is a tool requirement.

Doctor of Philosophy in the field of physics—Required: the general requirements stated under the Graduate School of Arts and Sciences, and the successful completion of one of the two following tool requirement options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of Stat 197 with a grade of *A* or *B*.

Research fields: nuclear physics: experimental and theoretical studies on the structure, electromagnetic interactions and scattering of few-body systems at low and intermediate energies, and solid state physics: crystal growth and physical properties of whiskers.

Bachelor of Arts in Education and Human Development with a teaching field in physics—Prerequisite: the education curriculum; required: the physics option and the professional courses stated under the School of Education and Human Development.

Departmental prerequisite for second-group courses—Bachelor of Arts: Phys 13, 14, 15, 16; three semesters of calculus; and consent of a departmental advisor. Bachelor of Science: Phys 1, 2, 14, 15, 16; three semesters of calculus; and consent of a departmental advisor. Phys 106, 127, and 151 are exempt from these prerequisites.

Undergraduate departmental advisors: W. Parke, N. Khatcheressian, M. Taragin
Graduate departmental advisors: D. Lehman, F. Prats

ASTRONOMY

First Group

9–10 Introduction to Astronomy (3–3) — Hobbs

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $15 per semester. (Academic year)

11–12 Introduction to Astronomy (2–2) — Hobbs

Same as Phys 9–10 without the laboratory. (Academic year)

Second Group

121 Modern Cosmology (3) — Hobbs

(Formerly Phys 21)

Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

PHYSICS

First Group

1 General Physics I (4) — Parke, Peverley

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $20.

2 General Physics II (4) — Zuchelli, Eisenstein

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $20.

3 General Physics I (3) — Parke, Peverley

Same as Phys 1 without laboratory. This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 1.

4 General Physics II (3) — Zuchelli, Eisenstein

Same as Phys 2 without laboratory. This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 2.

13 General Physics for Engineering and Applied Science (3) — Peverley, Briscoe

Development of basic principles of classical mechanics including statics and dynamics of rigid bodies and simple fluid mechanics, wave motion, geometrical and physical optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6.

14 Mechanics and Thermal Physics (3) — Khatcheressian

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macro-

scopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent; Math 31. Laboratory fee, $20.

15 **Electricity and Magnetism** (3) Taragin, Peverley
Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss' Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent; Math 31. Laboratory fee, $20.

16 **Modern Physics** (3) Lehman
Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Topics include wave-particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

Second Group

106 **Energy and the Environment** (3) Lehman
Consideration of energy resources and their utilizational impact on the environment from a physical viewpoint. Topics include: the demand for energy, the cost of energy, nuclear fission-radiation hazard to humans, pollution due to energy sources, transportation of energy and waste, and energy converters. Prerequisite: high school algebra.

127–28 **Physics in the Life Sciences** (3–3) Parke
Principles of physics applied to biological systems and to medical instrumentation, including ultrasonics, circulation dynamics, bioenergetics, optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 2 or equivalent.

151–52 **Intermediate Laboratory** (3–3) Taragin, Khatcheressian
Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, $15. (Fall and spring)

161 **Mechanics I** (3) Prats
Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

162 **Mechanics II** (3) Bergmann
Basic aspect of continua, including elasticity and fluid dynamics, strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 **Physical and Quantum Optics** (3) Eisenstein, Hobbs
Oscillations and waves, energy and momentum of the electromagnetic field, interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.

164 **Thermodynamics** (3) Taragin, Parke
Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 **Electromagnetic Theory** (3–3) Zuchelli
Development of Maxwell's field equations using vector and tensor calculus, electrostatics, stationary and nonstationary phenomena, basic circuit theory, electromagnetic waves and radiation.

167 **Principles of Quantum Physics** (3) Harper
Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.

168 **Applied Quantum Physics** (3) Harper
Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. **Prerequisite: Phys 167 or equivalent.**

170 **Elementary Solid State Physics** (3) Khatcheressian, Eisenstein
Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.

175 **Nuclear Physics (3)** **Lehman, Prats**
Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid-drop model, beta-decay, fission, and fusion. **Prerequisite: Phys 167 or permission of instructor.**

195–96 **Undergraduate Research** (3–3) Staff
Research on problems approved by the staff. For the B.A. option, emphasis will be placed on advanced laboratory experience. For the B.S. option, the two semesters will involve advanced laboratory experience and applications of computers in the solution of physics problems, respectively.

Third Group

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics.

201–2 **Interdisciplinary Science** (4–4) Levy, Merchant, Parke
Joint offering of the Departments of Biological Sciences, Chemistry, and Physics. A treatment of scientific methodology and knowledge, both principles and facts. Designed to provide a basic understanding of the natural sciences and of the nature of science itself. Overview of the known fundamental principles developed in scientific observation of the physical universe. Fundamental principles are applied to systems of increasing complexity, with emphasis on physical, chemical, and biological systems. Students enrolled in natural science programs may not take this course for credit. Prerequisite: high school algebra or equivalent.

211 **Advanced Mechanics** (3) Bergmann, Taragin
Analytic methods of mechanics as a basis for modern theory: variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

212 **Special Relativity** (3) Zuchelli
Application of relativistic concepts to the basic fields of physics: space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

213 **Electromagnetic Theory: Macroscopic Effects** (3) Eisenstein
Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.

214 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Bergmann, Eisenstein
Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

221–22 **Quantum Mechanics** (3–3) Prats
General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations and transformation theory. Schrödinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

224 **Statistical Mechanics** (3) Bergmann
Study of classical and quantum equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distribution functions, H-theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

225–26 **Laboratory** (3–3) Hobbs
Individual work on special topics. Laboratory fee, $20 per semester. (Academic year)

231 **Quantum Electrodynamics: Theory and Applications** (3) Lehman
A presentation of the lower order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron-electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

232 **Quantum Field Theory** (3) Bergmann
Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S-matrix, dispersion relations, and renormalization program.

233 **Nuclear Theory** (3) Prats, Lehman, Harper
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics and weak interactions.

243 **Solid State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Peverley
Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid State Physics: Electronic Processes in Metals** (3) Khatcheressian, Eisenstein
Phenomena in metals and semi-conductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

250 **Selected Topics in Modern Physics** (3) **Staff**
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring)

291 **Seminar** (1) **Staff**
Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHYSIOLOGY—GRADUATE PROGRAMS

Professors C.S. Tidball, R.A. Kenney *(Chairman)*, M.E. Tidball, M.M. Cassidy, M.J. Jackson
Associate Professors R.A. Lavine, D.W. Watkins
Assistant Professor J.K. Kelleher

Master of Science in the field of physiology—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. In addition to the thesis, the 30 hours of required work includes Phyl 201, 205, 212, 221, 298.

Doctor of Philosophy in the field of physiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a minor field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination includes Phyl 201, 205, 212, 221, 298, 396, 397.

Research fields and areas of study: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201, except Phyl 205, 221, and 212.

Second Group

191 **Selected Topics in Human Structure and Function** (3) Kenney
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor. (Fall)

Third Group

201 Physiology (8) **Staff**
Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 221 or Phyl 205, or consent of chairman of department. Open to Consortium students only with permission of department chairman. (Spring)

205 Cell Biophysics (2) Jackson, Kelleher
Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)

212 Neurobiology (3) **Staff**
Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25. (Spring)

221 Seminar (1) **Cassidy**
Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

253 Physiology of Fluid Balance and Hydrogen Ion Regulation (2) **Cassidy**
Discussion on principles of fluid and acid-base balance and the application of these principles to scientific situations. (Fall)

260 Membrane Physiology (2) **Jackson**
Weekly lectures or seminar. Systematic review of the factors which determine the movements of water and solutes across simple cellular membranes and complex epithelial barriers in animal tissues. Prerequisite: Phyl 205 or permission of instructor. (Fall)

261 Gastrointestinal Physiology (1 or 2) Jackson
Weekly seminar; role of basic sciences in gastroenterology; intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 Topics in Cardiovascular Physiology (2) **Kenney**
Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

269 Topics in Neurophysiology and Psychophysiology (2) **Lavine**
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

272 Reading and Research in Simulation of Physiological Processes (3) C. Tidball
Readings in physiological simulations and their evaluation. Informal discussions at regular intervals. Prerequisite: Phyl 271 or equivalent or permission of instructor. May be repeated once for credit.

295 Research (arr.) **Staff**
By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of

credit. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (5) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

396 **Advanced Reading and Research** (2) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of Physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

POLISH

See Slavic Languages and Literatures.

POLITICAL COMMUNICATIONS

Committee on Political Communications
P. Robbins *(Chairman)*, W.C. Adams, R.S. French, S.R. Lichter, J.S. Morgan, W.M. Reynolds, J.R. Thiel

Columbian College of Arts and Sciences offers an interdepartmental program in political communications leading to the degree of Bachelor of Arts. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Majors in this field are advised that among the courses listed below, SpDr 49, 133, and 143 can be counted toward fulfillment of the meaningful initiation requirement in the humanities. The prerequisite courses in statistics can be counted toward the requirement in the natural and mathematical sciences.
2. **Prerequisite courses:**
   (a) **Stat 51 or 53 and 105 or 107.**
   (b) **PSc 1 and 2; Econ 1–2.**
   (c) **SpDr 1, 49 or 143, 133 (SpDr 143 and 133 are recommended for the sophomore year).**
   (d) **Jour 71–72.**
   (e) **Psyc 1 or 5 or 6, and 151 (Psyc 151 is recommended for the sophomore year).**
3. Required courses in the major (45 semester hours):
   (a) **PSc 101, 120; three courses chosen from PSc 104, 111, 112, 114, 115, 116, 117, 118, 119, 122, 124, and Hist 134.**

(b) Jour 111; two courses chosen from Jour 137, 139, 145, 146, 150, 151.
(c) SpDr 134; one course chosen from SpDr 112, 121, 126, 141; one course chosen from SpDr 145, 149, 175, 176.
(d) PSc/Jour 128, PSc/Jour/SpDr 129, Jour 198, PCm 199.

191–92 **Field Experience** (3–3)
Open to juniors and seniors majoring in political communications. Students will spend at least 12 hours a week during the semester in an approved agency or office performing practical work in the subject under the general guidance of a faculty advisor.

199 **Senior Seminar in Political Communications** (3)
Limited to majors in political communications. Selected reading and discussion with possible field work in the professional subject.

POLITICAL SCIENCE

Professors R.E. Purcell, H.L. LeBlanc *(Chairman)*, B. Nimer, A. Gyorgy, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich, Y.C. Kim, S.J. Wayne, J.M. Logsdon
Associate Professors C.F. Elliott, C.A. Linden, H.R. Nau, D. Klingman, C. McClintock
Assistant Professors M.J. Sodaro, S.L. Wolchik, J.R. Henig, C.J. Deering, S.S. Smith, S.R. Lichter, H.B. Feigenbaum, C.C. Joyner, R.W. Rycroft, D.A. Bositis, J.H. Lebovic, D.N. Balaam *(Visiting)*
Adjunct Assistant Professor G.R. Kieval

Bachelor of Arts with a major in political science (departmental)—**The following requirements must be fulfilled:**

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite: PSc 1 and 2. Six courses in the social sciences, other than political science, to include six hours of history or six hours of economics. Twelve semester hours of introductory foreign language and statistics are strongly recommended.

3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement which consists of six semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 109, 110. Group B (American government and politics)—PSc 111, 112, 114, 115, 116, 117, 118, 119, 120, 122, 124, 129. Group C (comparative government and politics)—PSc 130, 131, 146, 165, 168, 170, 173, 177, 179, 180, 181, 183. Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 161, 178, 182, 184.

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete a proseminar or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program; such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the permission of the instructor and the undergraduate coordinator.

The Department also offers a major with a public policy focus. Students who wish to concentrate in public policy must distribute their 30 hours in political science as follows: 3 semester hours from each of Groups A, B, C, D; PSc 104; 9 semester hours in policy-oriented courses to be selected from a group designated by the program advisor; and one policy-oriented proseminar.

Up to 12 hours of either service-learning or internship credit may be applied towards a degree. No more than six hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program (see pages 80–81) must receive grades of *A* in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements stated under Regulations and take at least one political science honors seminar in which an independent study project is completed with distinction. The project is reviewed by a Departmental Honors Committee. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, and have achieved a QPI in the major of at least 3.5 as juniors or at least 3.3 as seniors.

Minor in political science—Required: 15 semester hours of second-group political science courses, including a distribution requirement of one course from each of the four groups listed in item 3 above. A minimum of 9 semester hours of other social science courses is also required.

Master of Arts in the field of political science—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements stated under the Graduate School of Arts and Sciences and either a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to six semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

The Department also offers a special concentration in electoral politics. For students choosing this option, the 33-hour non-thesis option is required. The curriculum is composed of 24 hours of required courses related to the theory and practice of electoral politics and 9 hours of elective work in American government and politics.

All students must take one course chosen from PSc 200, 230, or 240 during the first semester of graduate study. The course selected must have the approval of the coordinator of graduate studies (students with a special concentration in electoral politics are excepted).

Doctor of Philosophy in the field of political science—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required: The general requirements stated under the Graduate School of Arts and Sciences. Each student must complete a General Examination, which covers a major and minor field of study.

PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from five principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist-Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, international organization, regional international relations, and foreign relations of a specified major political system); (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, science policy, and state, local, and urban politics); and (5) public policy (methods of public policy analysis, science policy, domestic policy analysis, and national security policy). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

Departmental prerequisite: PSc 1 and 2 (or their equivalent) are prerequisite to all second-group courses in political science.

First Group

1 **Introduction to Comparative and International Politics** (3) — Gyorgy, Sodaro
Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)

2 **Introduction to American Politics and Government** (3) — LeBlanc, Wayne, Morgan, Smith
Structure, powers, and processes of the American political system. (Fall and spring)

3–4 **Introduction to Political Behavior** (6–6) — Lichter
(Formerly PSc 3, 3 credits)
Role of personal and social values in political behavior. Fall: focus on problems in the American liberal tradition; spring: a comparative perspective on democratic and authoritarian governments in the 20th century. Admission by special selection process. (Academic year)

50 **Washington, D.C.: Culture and Politics** (3) — Gillette and Interdisciplinary Team
(Formerly Hum 40)
Same as AmCv/Hist 50.

*91 **East Asia—Past and Present** (3) — Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia. (Spring)

Second Group

101 **Scope and Methods of Political Science** (3) — Kim, Smith, Bositis, Lebovic
Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3) — Smith, Bositis
Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

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* An interdepartmental course offered by the Political Science, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Religion Departments.

104 **Methods of Public Policy Analysis** (3) Henig, Klingman
Introductory overview of the concepts, issues, and techniques of systematic policy analysis and its role in the policy process. (Fall and spring)

105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden
Foundations of Western political thought—Plato to Aquinas. (Fall and spring)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau. (Fall and spring)

107 **Issues in Modern Political Thought** (3) Linden, Wolchik
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall)

108 **Modern Communist Ideologies** (3) Elliott
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on the careers and ideas of leading figures: Marx, Engels, Lenin, Stalin, Khrushchev, and Mao. (Spring)

109 **Democratic Theory** (3) Staff
Issues of recent democratic thought and theory, particularly in relation to the contemporary American political process. (Fall)

110 **American Political Thought** (3) Morgan
Political thought in the U. S. from colonial times to the present as seen through major representative writings. (Spring)

111 **State and Urban Politics** (3) Henig
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

112 **State and Urban Policy Problems** (3) Henig
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring)

114 **U.S. Constitutional Law and Politics I** (3) Morgan
Separation of powers, federal-state relationships, economic regulation. (Fall)

115 **U.S. Constitutional Law and Politics II** (3) Morgan
Political and civil rights. (Spring)

116 **The American Presidency** (3) Wayne
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance. (Fall and spring)

117 **Public Administration and Bureaucratic Politics** (3) Rycroft
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Fall)

118 **Legislative Process** (3) Deering, Smith
Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive-legislative relations and interest-group activities. (Fall and spring)

119 **U.S. Political Parties and Politics** (3) LeBlanc
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring)

120 **Public Opinion and Political Socialization** (3) Staff
Sources of mass political attitudes and behavior; voting and political campaigning. (Fall)

122 **Science, Technology, and Politics** (3) Logsdon, Rycroft
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring)

124 **Issues in Domestic Public Policy** (3) Henig, Deering
Examination of the decision-making process and the substance of various issues in domestic public policy in such areas as crime, economics, education, energy, the environment, poverty, and health. (Fall and spring)

128 **Governmental Processes and the News Media** (3) Deakin
Same as Jour 128.

129 **TV News: The Politics of Visibility** (3) Lichter
Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. Same as Jour/SpDr 129. (Fall and spring)

130 **Comparative Government and Politics I** (3) Feigenbaum, McClintock
Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 **Comparative Government and Politics II** (3) Gyorgy, Sodaro, Wolchik
Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 **International Politics** (3) Nau, Joyner, Lebovic
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 **International Organizations** (3) Nau, Stambuk
Development and operations of the United Nations, regional organizations, and functional international organizations. (Fall and spring)

144 **Public International Law** (3) Joyner
Survey of international law, with emphasis upon law's conceptual development and practical application to contemporary international issues. (Fall and spring)

146 **U.S. Foreign Policy** (3) Purcell
Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)

149 **Military Force and Foreign Policy** (3) Staff
Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall and spring)

161 **European-Atlantic Relations** (3) Stambuk
International politics of the North Atlantic area, the European Common Market, and U.S.-European relations. (Fall)

165 **Government and Politics in Eastern Europe** (3) Gyorgy
Study of the contemporary social and ethnic structures, governmental systems, and international position of the Eastern European states within the Soviet system. (Summer)

168 **Soviet Foreign Policy** (3) — Elliott
Relations with U. S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of China and Japan** (3) — Hinton
Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts. (Fall)

173 **Governments and Politics of South and Southeast Asia** (3) — Hinton, Purcell
Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia. (Fall and spring)

177 **Governments and Politics of the Middle East** (3) — Reich, Joyner
Politics of the eastern Arab states, Turkey, Iran, Israel. (Fall)

178 **International Relations of the Middle East** (3) — Reich
Analysis of the regional and international relations of the Middle East. (Spring)

179 **Israeli Foreign Policy** (3) — Reich
Examination of the institutions, processes, and issues of Israeli foreign policy. (Fall)

180 **Governments and Politics of North Africa** (3) — Reich, Lewis
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring)

181 **Politics of Middle and Southern Africa** (3) — Nimer
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3) — Nimer
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent. (Spring)

183 **Governments and Politics of Latin America** (3) — McClintock
Political processes and institutions in Latin America, particularly Mexico, Chile, Peru, Brazil, and Cuba. Emphasis on issues of reform and revolution. (Fall)

184 **International Relations of Latin America** (3) — McClintock
U. S.-Latin American relations, inter-American diplomacy and organization, foreign policies of selected states. (Spring)

*187 **Internship: Political Behavior** (3) — Deering
Study of political behavior through internship experience with Congress, executive departments or agencies, politically active private-sector groups, political parties, or electoral campaigns. May be repeated for credit with approval. (Fall and spring)

*188 **Internship: Urban Affairs** (3 or 6) — Henig
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. (Fall and spring)

*189 **Internship: Legal Process** (6) — Aron
The legal system and its role in promoting social change. Readings, group discussions, and work with lawyers and third-year law students. (Fall and spring)

190 **Selected Topics in Political Science** (3) — Staff
(Fall and spring)

* Admission requires departmental approval.

*191 **Selected Topics: International Affairs** (3 or 6) Staff
Examination of selected problems in international relations. (Fall and spring)

*192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. (Fall and spring)

*193 **Proseminar: Urban Affairs** (3 or 6) Henig
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. (Fall and spring)

*196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*199 **Honors Seminar: International Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

Third Group

200 **Introduction to Political Analysis** (3) Smith, Bositis
(Formerly Scope and Methods of Political Science)
Alternative approaches to political analysis, construction of research designs, and problems of measurement. (Fall and spring)

201 **Empirical Political Analysis** (3) Smith, Bositis
Techniques of social science data analysis, with emphasis on statistics and computer applications. PSc 200 or other previous introductory research training is highly desirable. (Spring)

202 **Advanced Topics in Empirical Political Analysis** (3) Smith, Bositis
Advanced techniques of data collection and analysis; varying emphasis on such methods as causal modeling, analysis of variance, regression analysis, and simulation. (Fall)

203 **Approaches to Public Policy Analysis** (3) Henig, Klingman
Empirical and normative foundations of systematic policy analysis: concepts, theories, models, issues, strengths, limitations, and uses and misuses in the policy process. (Fall).

204 **Methods of Public Policy Analysis** (3) Klingman
(Formerly Methods of Legislative Research)
Quantitative and qualitative techniques of systematic policy analysis, such as forecasting, cost-benefit analysis, simulation, operations research, social indicators, and quasi-experimental methods. Prerequisite: PSc 203 or equivalent. (Spring)

205 **Readings in Political Theory** (3) Linden
Selected major works, both ancient and modern, which illuminate basic problems and questions of political theory. (Fall)

206 **Topics in Political Theory** (3) Linden
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)

207 **Readings in Socialism and Communism** (3) Elliott, Linden, Wolchik
Readings and discussions of works illuminating the development of pre- and post-Marxian socialist thought. (Fall)

208 **Readings in Marxism-Leninism** (3) Elliott, Linden
Readings and discussions in Marxism-Leninism and its controversies from Lenin to the present. (Spring)

* Admission requires departmental approval.

210 **The American Political Process** (3) Deering and Staff
For graduate students with a limited background in American government. A survey of American political institutions, processes, and behavior. Departmental prerequisites waived. (Fall)

211 **State and Urban Politics** (3) Henig
Comparative analysis of the context, institutions, processes, and policies of state and urban political systems. (Fall)

212 **State and Urban Policy Problems** (3) Henig
Analysis of public policy issues confronting state and urban governments; emphasis on the theoretical roots and empirical impact of past and present programs in such areas as housing, education, poverty, and crime. (Spring)

214 **Topics in Constitutional Law** (3) Morgan
Lectures and group discussions on constitutional law and politics. (Fall, even years)

215 **Judicial Policy-making** (3) Morgan
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. (Fall, odd years)

216 **American Presidency** (3) Wayne
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making. (Fall)

217 **Bureaucratic Politics** (3) Rycroft
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring)

218 **Legislative Theory and Behavior** (3) Deering, Smith
Theory, structure, and process of the U.S. Congress, with emphasis on member-constituency relations, individual and collective decision-making, party and committee activities, executive-legislative relations, and interest-group activities. (Spring)

219 **American Political Parties and Electoral Behavior** (3) LeBlanc
Nature and functions of political parties, with special emphasis on party influences on electoral behavior and congressional decision-making. (Fall)

220 **Public Opinion and Political Socialization** (3) Staff
Sources and dynamics of public opinion and political socialization. (Spring)

222 **Government, Science, and Technology** (3) Logsdon, Rycroft
National and international policy issues which arise from the interaction between scientific and technological development and governmental activity. (Fall)

223 **Science, Technology, and Public Affairs** (3) Logsdon, Rycroft
Intensive examination of selected public policy issues with significant scientific or technological aspects. Prerequisite: PSc 222 or permission of instructor. (Spring)

224 **Domestic Policy Analysis—Selected Topics** (3) Staff
Analysis of U.S. policy toward selected domestic problems.

225 **Issues in Political Economy: Economic Policy Analysis** (3) Staff
Analysis of selected topics in U.S. monetary and fiscal policy. Offered off campus only.

226 **Issues in Political Economy:** Staff
The Economic Policy Process (3)
Economic analysis of selected legislative issues and the effect of various economic pressures on policy outcomes. Offered off campus only.

230 **Comparative Government and Politics I** (3) Kim, McClintock, Feigenbaum
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, McClintock, Feigenbaum
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

232 **Comparative Communist Systems I** (3) Wolchik
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. Same as Hist 232. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. Same as Hist 233. (Spring)

234 **Comparative Legislative Systems** (3) Staff
Selected problems of legislative theory and behavior from a comparative perspective with particular reference to the parliamentary systems of West Germany, France, and Britain.

240 **Theories of International Politics I** (3) Nimer, Lebovic
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Lebovic
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

242 **Problems in International Organizations I** (3) Nau, Stambuk
Collective security, law, and the politics of international organizations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
Social and economic interdependence and the politics of international organizations. (Spring)

244 **International Law I** (3) Joyner
The sources and development of international law, with special attention given to current trends and future problems. (Fall)

245 **International Law II** (3) Joyner
Critical examination of selected contemporary problems of world order, e.g., legal issues involving global resource regimes, economic development, and human rights. (Spring)

246 **U.S. Foreign Policy** (3) Staff
Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution. (Fall)

247 **Public Opinion and Foreign Policy** (3) Staff
Research and readings on U.S. public opinion interest groups that influence foreign policy. (Spring)

248 **U.S. National Security Policy-making** (3) Sapin
Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)

249 **U.S. National Security Policy** (3) Sapin
Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)

250 **Foreign Policy Analysis—Selected Topics** (3) Staff
Analysis of U.S. foreign policy toward selected world regions.

252 **Science, Technology, and World Order** (3) Nau
Intensive reading, discussion, and research on the impact of science and technology on world order, in particular on the claim that a new global politics is replacing traditional or nation-state politics. (Spring)

258 **Communist Party of the Soviet Union** (3) Sodaro
Analysis of the internal evolution of the Community Party and its role in the Soviet system from its origins to the present day. Same as Hist 258. (Spring)

260 **Western European Politics** (3) Feigenbaum
Examination of the principal characteristics of the British, French, West German, and Italian political systems, comparing their institutional and behavioral adaptations to the problems of advanced industrial democracies. (Fall)

261 **Politics of the European Community** (3) Stambuk
Problems in Western European politics, with emphasis on supranational political processes and selected policy outcomes in the context of the European Common Market. (Spring)

263 **Communism in Non-Communist Europe** (3) Sodaro
Examination of non-ruling European communist parties; relations between these parties and other ruling and non-ruling communist parties. (Fall)

264 **The International Politics of Eastern Europe** (3) Gyorgy and Staff
Major historical, political, social, and regional factors which have shaped the inter-war, World War II, and post-war evolution of Eastern Europe; emphasis on foreign relations with outside powers and on regional East-West contacts. (Fall)

265 **Governments and Politics of Eastern Europe** (3) Gyorgy and Staff
A comparative study of Eastern European states: political, social, economic institutions; emphasis on domestic conditions and problems of individual Eastern European countries. (Spring)

266 **Readings in Soviet Government and Politics** (3) Elliott, Linden
Readings in contemporary Soviet domestic government and politics. (Fall)

267 **Soviet Government and Politics** (3) Elliott, Linden, Wolchik
Research seminar in selected problems of Soviet domestic government and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) Elliott
External problems and policies of the USSR, with emphasis on the period since Khrushchev. Relations with other communist states, Western powers, other countries, and non-ruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) Wolfe, Elliott
Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought. (Fall or spring)

270 **Politics of the People's Republic of China I** (3) Hinton
Introduction to the substance of and literature on contemporary Chinese politics. Discussion and reading. (Fall)

271 **Politics of the People's Republic of China II** (3) Hinton
Research seminar. Introduction to the analysis of official Chinese documents; presentation of student papers. (Spring)

272 **Foreign Policy of the People's Republic of China** (3) Hinton
Objectives; formulation and implementation; the People's Republic

of China as Asian state, revolutionary influence, would-be great power. (Spring, even years)

273 **Governments and Politics of South and Southeast Asia** (3) Staff
Research and selected readings as basis for analysis of structure, problems, and policies of the governments of selected countries; particular reference to India. (Spring)

275 **International Politics of the Far East** (3) Hinton
Foreign policies and international behavior of the regional states (especially China, Japan, and Vietnam) and the extraregional powers (especially the U.S. and the U.S.S.R.). (Spring, odd years)

276 **Governments and Politics of Japan and Korea** (3) Kim
Readings and research on the domestic and foreign policies of Japan, North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) Reich
Readings and research on selected problems of the governments and politics of the Middle East. (Fall)

278 **International Relations of the Middle East** (3) Reich
Readings and research on the regional and international relations of the Middle East. (Spring)

280 **Governments and Politics of North Africa** (3) Reich
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Fall)

281 **Topics in African Politics** (3) Nimer
Readings, research, and discussion of selected aspects of African domestic and international politics. (Fall)

283 **Governments and Politics of Latin America** (3) McClintock
Readings and discussion on politics in Latin America, particularly Mexico, Chile, Peru, Brazil, and Cuba. Emphasis on issues of reform and revolution. (Fall)

284 **International Relations of Latin America** (3) McClintock
Readings and discussion on U.S.-Latin American relations and the foreign policies of selected states. (Spring)

285 **Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Geog/Hist/Span 287. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

286 **Selected Topics in American Politics** (3) Staff
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staff
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staff
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staff
Readings and discussion. (Fall or spring)

290 **Colloquium: Middle East** (3) Reich
Interuniversity colloquium for advanced students of Middle East affairs. Admission by permission of the instructor. (Fall and spring)

291 **Colloquium: East Asia** (3) Hinton
Interuniversity colloquium for advanced students of Far Eastern affairs. Admission by permission of the instructor. (Fall and spring)

292 **Colloquium: Russia and Eastern Europe** (3) Gyorgy
Interuniversity colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor. (Fall and spring)

297 **Reading** (3) **Staff**
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

298 **Research** (3) **Staff**
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**

510 **Campaign Research** (3) Staff
Methods of data collection and analysis: polling, questionnaire construction, sampling, targeting, and interpretation of data. Prerequisite: PSc 201.

511 **Electoral Laws and Financial Practices** (3) Staff
State statutes; registration and filing procedures; federal campaign finance legislation, compliance procedures, and enforcement. Offered as the demand warrants.

512 **Campaign Organization and Management** (3) Staff
Readings and discussions on modern campaigning: field work, media planning, public relations, fund raising, strategy, and tactics. Guest lectures by professional campaign consultants. Offered as the demand warrants.

513 **Seminar: The Electoral Process** (3) Staff
Research leading to the development of a campaign plan for a particular electoral contest: use of the media, polling, campaigning, organization, issue development, and fund raising. Enrollment by permission of the instructor. Offered as the demand warrants.

514 **Media and Politics** (3) Staff
Role of the media in modern electoral politics, with emphasis on television news coverage, political debates, political advertising, and their impact on the electorate. Offered as the demand warrants.

515 **Internship: Electoral Behavior** (3) Staff
Study of the political system through an internship with a political campaign. Offered as the demand warrants.

Fourth Group

301 **Advanced Reading and Research in Political Theory** (3) **Staff**

310 **Advanced Reading and Research in American Politics** (3) **Staff**

340 **Advanced Reading and Research in Comparative Politics** (3) **Staff**

350 **Advanced Reading and Research in International Politics** (3) **Staff**

397 **Advanced Reading** (3) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PORTUGUESE

See Romance Languages and Literatures.

PSYCHOLOGY

Professors T. Hunt (*Emeritus*), E.L. Phillips, J.N. Mosél, B.I. Levy, W.E.

Caldwell, R.D. Walk, R.K. White *(Emeritus)*, A.D. Kirsch, E. Johnson *(Emeritus)*, V. Kirkbride *(Emeritus)*, C.E. Rice, E. Abravanel *(Chairman)*, D.E. Silber, J. Miller, C.J. Lange, A.J. Caron *(Research)*, F.L. Schmidt *(Research)*, L.A. Rothblat, M.L. Meltzer

Adjunct Professor R.F. Caron

Professorial Lecturers R.K. Kahn, S.L. Cohen

Associate Professors C.E. Tuthill, S.A. Karp, R.W. Holmstrom, P.J. Poppen, L. Brandt, S.K. Green, S. Hashtroudi

Adjunct Associate Professor D.G. Kleiman

Associate Professorial Lecturer J.K. Harper

Assistant Professors L.R. Offermann, M.H. Charlop

Clinical Training Staff

Clinical Professor J. Borriello

Associate Clinical Professors I.M. Zimmerman, J.W. Cummings, M.E. Zedek, E. Blum, P.D. Daen, D.A. Evans

Bachelor of Arts with a major in psychology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—seven or eight semester hours selected from Psyc 1, 5 and 6.

3. Required courses in related areas:

(a) three semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 6. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 9 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended), political science or sociology, of which six hours must be from one of the following: anthropology, economics, history, political science or sociology. If a student takes more than six hours in any one department, the excess will be credited to electives.

4. Required courses in the major—27 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—*Group A:* Psyc 118, 121, 161; *Group B:* Psyc 115, 144, 151, 156; *Group C:* Psyc 101, 129, 131; *Group D:* Psyc 110, 111, 112, 132.

It is recommended that students contact their academic advisors as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that many graduate schools require knowledge of one and sometimes two foreign languages.

To qualify for graduation with Special Honors the student must fulfill the general requirements stated under Regulations, take an honors seminar (Psyc 197), and complete an independent study project (Psyc 191) with distinction. The grade point average in psychology required for graduation with Special Honors is 3.3.

Minor in psychology—18 semester hours are required, including Psyc 1 and at least 9 semester hours of second-group psychology courses. Students considering graduate study in psychology are advised to take Psyc 5 or 6, a distribution of courses from categories A, B, C, D above, Psyc 196, and an elementary course in statistics.

Master of Arts in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent

degree. Admission to the program is limited; preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 required semester hours (exclusive of the thesis), a minimum of 18 must be in third-group psychology courses including Psyc 202 and either 203 or 204; six may be in related fields approved by the department. For detailed requirements consult the chairman of the department.

Doctor of Philosophy in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Miller Analogies Test and the Aptitude Test of the Graduate Record Examination are required for admission.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) the satisfactory completion of the tool requirement; (2) Psyc 202, 203–4, and an appropriate statistics course; and (3) the satisfactory completion of a Preliminary Examination and a major Field Examination.

Areas of study: clinical, developmental, experimental, industrial and organizational, and social psychology.

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of instructor students may elect Psyc 5–6 in the freshman year.

First Group

1 General Psychology (3) **Staff**
Fundamental principles underlying human behavior. (Fall and spring)

5–6 Principles and Methods of Psychology (4–4) Walk, Hashtroudi
Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, $10 per semester. [Academic year]

8 Psychology of Motivation and Personality (3) Staff
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 Introduction to Educational Psychology (3) Kirkbride
The contributions of psychology to education; emphasis on learning.

Second Group

101 Abnormal Psychology (3) Silber, Holmstrom
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)

104 Ecology and Mental Health (3) Karp
Examination by field research of the linkages between aspects of the physical environment and mental health. Lectures and student field research projects. (Fall)

105 The Psychology of Consumer Behavior and Attitudes (3) Phillips
Consumer behavior and attitudes in regard to advertising, buying

habits, consumer action groups and social pressures, and mass persuasion. Lectures and field work. (Spring)

108 **Humanistic Psychology** (3) Mosél
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential and phenomenological psychology, the new mentalism. (Spring)

110 **Perception and Understanding in Children** (3) Abravanel
Concepts and research in the area of developmental psychology; emphasis on the growth and development of perception, cognition, and language. (Spring)

111 **Psychology of Childhood** (3) Brandt
(Formerly Psyc 29)
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.

112 **Psychology of Adolescence** (3) Charlop
Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems. (Fall and spring)

115 **Psychology of Language and Communication** (3) Mosél
Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in the perception and learning of language. (Fall and spring)

117 **Psychology of Art and Picture Perception** (3) Walk
Principles of perception as applied to art. Theories of Arnheim, Gibson, Gombrich, and Goodman as related to art and picture perception; study of cross-cultural research and research with children.

118 **Neuropsychology** (3) Rothblat
Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fall and spring)

119 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited. (Spring)

121 **Psychology of Learning** (3) Hashtroudi
Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 **Psychology and Human Relations** (3) Silber
Understanding human relations and T-group techniques by evolving an on-going T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

129 **Theories of Personality** (3) Karp, Poppen
Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 **Seminar: Political and Social Implications of Current Approaches to Psychological Treatment** (3) Karp
Discussion and presentation of recent works, such as those of Szasz, Goffman, and various writers on minority liberation, bearing upon the implications for individuals and society of various approaches

to psychological treatment, including psychotherapy and behavior modification.

131 **Psychological Tests** (3) Hunt, Karp, Levy
Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $10. (Fall and spring)

132 **Socialization in Childhood** (3) Brandt
Examination of primary methods by which the child is shaped in terms of social judgment and self control; internalization of controls, assimilation of societal values and parenting procedures. Organized by focus on issues according to developmental level.

135 **Freud and Modern Psychoanalysis** (3) Miller
Introduction to the work of Freud and his impact on modern psychoanalysis, focusing on the meaning of dreams and the unconscious function of conflict and defense, infantile sexuality and the Oedipus conflict, development of the ego, theory of anxiety and neurosis, and the death instinct. (Spring)

144 **Industrial/Organizational Psychology** (3) Offermann
Psychological concepts and methods applied to problems of personnel management, employee motivation and productivity, supervisory leadership, and organizational development. (Fall and spring)

150 **Psychology of Sex Differences** (3) Poppen
Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3) Tuthill, Poppen, Green
Social foundations of behavior: cognition, motivation, role-behavior, communication, small-group processes, and attitudes. (Fall and spring)

154 **Psychology of Criminology** (3) Silber
Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior. (Fall)

156 **Psychology of Attitudes and Public Opinion** (3) Tuthill
Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare.

158 **Psychology of Interpersonal Attraction** (3) Green
Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches, and interpersonal processes.

161 **Comparative Psychology** (3) Caldwell
Lectures and demonstrations on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology. (Spring)

168 **Principles and Techniques in Neuropsychological Research** (3) Rothblat
Introduction to basic anatomical, physiological and behavioral techniques used in neuropsychological research to explore relationships between the brain and behavior. Admission by permission of instructor. Laboratory fee, $20.

170 **Clinical Psychology** (3) Meltzer, Levy
An exploration of the history, functions, and problems of the clinical

psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psyc 101, 131. (Spring)

188 **Attitudes toward Death and Dying** (3) Staff
Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors.

191 **Independent Research in Psychology** (3) Staff
Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring)

192 **Field Experience in Psychology** (3) Abravanel
Senior psychology majors will spend a minimum of six hours a week in a local mental health, rehabilitation, school, or community setting. Students registering for this course must have prior approval of the instructor. (Fall and spring)

196 **History and Systems of Psychology** (3) Caldwell, Rice
Senior capstone course which includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. (Fall and spring)

197 **Honors Seminar in Psychology** (3) Staff
Selected topics in psychology which change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 (independent research) in the senior year. May be repeated for credit.

198 **Current Research Issues in Psychology** (3) Staff
Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

Third Group

Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstrom
Required in all graduate psychology programs. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics. (Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat and Staff
Required of doctoral students in psychology during first year of study. Psyc 203: basic issues in learning and motivation. Psyc 204: physiological processes; sensation and perception. (Academic year)

206 **Methods of Clinical and Personality Research** (3) Rice
Review of techniques especially relevant to research in clinical, personality, and social psychology. Scaling methods, multivariate techniques, introduction to the use of computers in data analysis. Prerequisite: Psyc 202; Stat 105 or equivalent. (Spring, odd years)

207–8 **Psychological Assessment** (3–3) Holmstrom, Levy, Silber, Meltzer
Open only to clinical graduate students in the Department of Psychology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, $10 per semester. (Academic year)

209 **Seminar: Psychology of Motivation** (3) Caldwell
Various theoretical approaches to the psychology of motivation;

systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Levy
Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $10. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Levy
Methods of personality assessment, primarily the Rorschach. Material fee, $10. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Brandt, Walk
Psyc 213: research and theory in developmental psychology, emphasis on perceptual and cognitive development; consideration of the development of social awareness and of genetic-biological growth processes. Psyc 214: current research and theory in perceptual, cognitive, and social development; intensive study of selected research problems. (Academic year)

215 **Personality Assessment by Multiple Procedures** (3) Charlop, Brandt
Consideration and use of a wide range of procedures in assessment of personality and psychopathology of children. Prerequisite: Psyc 207–8 or 211 and 212. Graduate students in fields other than psychology admitted by permission of instructor. Material fee, $10.

216 **Psychological Assessment by Graphic Means** (3) Levy
Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. (Summer)

219 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited. (Spring)

220 **Seminar: Abnormal Psychology** (3) Miller
Study of selected problems of psychopathology. (Fall)

221–22 **Seminar: Group Psychotherapy** (3–3) Borriello
For graduate students in the clinical psychology program. Open to others if space permits and with permission of instructor. Psyc 221: survey of group therapy approaches; Psyc 222: supervised experience with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. (Academic year)

223 **Seminar: Learning** (3) Hashtroudi
Selected topics of current research interest in the psychology of learning. (Spring)

225 **Seminar: Child Psychotherapy** (3) Charlop
Theory and practice of insight-oriented psychotherapy with children. Class observation of an ongoing treatment case. Supervised treatment of a child in a practicum setting. Permission of instructor required for all students except graduate students in the child clinical track. (Spring)

226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Brandt
For graduate students in psychology; open to others with permission of instructor, if space permits. Exploration of major topics concerning psychopathology in children and adolescents; discussion of nosological issues with emphasis on theoretical and research literature.

227–28 **Seminar: Principles of Psychotherapy** (3–3) Kahn
For graduate students in clinical psychology; open to others, with permission of instructor, only if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. Prerequisite: Psyc 218. (Academic year)

229 **Seminar: Principles of Behavior Change** (3) Phillips
Stimulus-organism-response variables and their interactions, with emphasis on learning theory as applied to clinical problems. (Fall)

231 **Development of Psychometric Instruments** (3) Mosél
Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)

232 **Ego Psychology and Theories of Object Relations** (3) Holmstrom
Emphasis on theoretical contributions of Freud, Hartmann, Kris, Klein, Rapaport, Kernberg, and others. Assessment and treatment are addressed, primarily with reference to investigations of borderline and characterological disorders. Permission of instructor required for all students except those in clinical psychology. (Spring)

234 **Seminar: Theory of Psychological Measurement** (3) Mosél
Examination of classical test theory (which underlies most current test construction and interpretation) and the newly emerging area of item-response theory. Recent developments in validity generalization. (Spring—alternate years)

235 **Seminar: Community Mental Health** (3) Miller
For graduate students in the Department of Psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues. Prerequisite: Psyc 219. (Fall)

237–38 **The Practice of General Psychology** (3–3) Meltzer
Application of psychological principles and findings to a wide spectrum of human problems. Professional issues facing the psychologist offering services. Participation in the development, implementation, and evaluation of applied psychological services and projects. (Academic year)

240 **Seminar: Selected Topics in Psychopathology** (3) Silber
Examination of current research and theory in psychopathology. (Spring)

241–42 **Family Systems: Theory, Practice, and Research** (3–3) Staff
Family dynamics and their implications for assessment and treatment. Special emphasis on the role of research in the process of evaluation of family systems and family therapy. Enrollment limited to advanced doctoral students in clinical psychology. (Academic year)

243 **Psychoanalytic Theory and Research** (3) Miller
An introduction to classical and modern psychoanalytic theory and

research. A review of Freud's central works, focusing on his case studies and their role in theory development. Emphasis on instinct theory, with comparisons to contemporary studies of dreams, infant observation, male and female personality development, psychopathology, and related topics.

244 **Theories and Processes of Organizational Management** (3)
Basic functions and techniques of organizational management—design, control, direction, and decision-making—examined from the viewpoint of behavioral science.

245 **Seminar: Organizational Behavior** (3) Mosél
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Evaluation Techniques** (3) Mosél, Harper
Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Cohen
Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. (Spring, even years)

249 **Organizational Behavior Modification** (3) Mosél
Application of operant reinforcement, behavioral systems analysis, and other experimentally derived procedures, such as goal-setting and feedback, to improving individual and group work performance. New approaches to intrinsic job motivation based on covert reinforcement principles. (Spring—alternate years)

250 **Human Resources Management** (3) Staff
An examination within a psychological systems perspective of the requirements for integrating employee assessment, placement, training, and motivation modules into a unified human resources development program. Emphasis on models and techniques of organizational development and the utilization of key organizational factors to determine content of the program.

251 **Seminar: Advanced Social Psychology** (3) Tuthill, Poppen, Green
Current research and theory: motivation and cognition, dissonance, social interaction theory, interpersonal processes, group dynamics, group conflict. (Fall)

252 **Research Methods in Social Psychology** (3) Tuthill, Poppen, White, Green
Selected methods such as public opinion polling, attitude scaling, interviewing, content analysis, naturalistic observation, field research or laboratory experimentation. May be repeated for credit. (Fall and spring)

254 **Seminar: Experimental Social Psychology** (3) Tuthill
Experimental study of small groups, group climates, interaction process analysis. Lewin's field-theoretical approach to individual and group processes. (Spring, odd years)

257 **Current Topics in Social Psychology** (3) Poppen, Green, Offermann
Advanced seminar with focus on major theoretical approaches, re-

search, or problem areas within field of social psychology. Topic changes each semester. (Fall and spring)

258 **Seminar: Attitude Change** (3) Tuthill
Review of recent research literature on attitude formation and change. Examination of theories of attitude change and experimental findings. (Spring, even years)

260 **Psychology of Work Group Development** (3) Offermann
Examination of theory and research on groups as task performance systems. Approaches to team development as a means of improving work group effectiveness, including goal setting, role clarification, increasing interpersonal skills, and conflict resolution. (Fall)

263 **Evaluation Research** (3) Rice
Research issues and methods in evaluating the impact of social intervention and service programs, especially those in mental health. Specification of program goals and effectiveness criteria; measurement problems; experimental and quasi-experimental designs; political problems surrounding evaluation research. (Spring, even years)

268 **Seminar: Neuropsychology** (3) Rothblat
Selected problems in research relating the brain and behavior. Independent topics each semester such as sensory processing, brain development and behavior, clinical aspects of nervous system function.

272 **Seminar: Theories of Personality** (3) Caldwell
Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Caldwell
Synthesis of the principles and findings of ethology and comparative psychology. Examination of the theories and findings of Lorenz, Tinbergen, and Jakob von Uexküll in the light of recent experimental investigations. (Fall, even years)

281 **Clinical Neuropsychology I** (3) Rothblat
Analysis of experimental and clinical findings from studies attempting to localize and interpret human brain dysfunction, with emphasis on perceptual and cognitive behavior. Topics include overviews of neuroanatomy and neurological techniques, clinical description and theoretical consideration of major neuropsychological disorders, mechanisms underlying recovery of function and potential for rehabilitation. Graduate students in fields other than psychology admitted by permission of the instructor.

282 **Clinical Neuropsychology II** (3) Levy and Staff
Examination of important psychological procedures for the assessment of human brain dysfunction. Instruments and batteries such as the Bender-Gestalt, Wechsler Adult Intelligence Scale, Halstead-Reitan Neuropsychological Battery, and Luria's Neuropsychological Tests. Prerequisite: Psyc 211, 212, 281, and permission of the instructor.

289 **Seminar: Current Topics in Experimental Psychology** (3) Staff
Review and discussion of contemporary research and theory in a specialized field of psychological study, by leaders in the field. Independent topics each semester; may be repeated for credit. (Fall and spring)

291 **Theories of Organizational Behavior** (3) Cohen
Examination of current theoretical models and research. (Spring, odd years)

292 **Seminar: Perception** (3) **Walk**
Study of current research and theory in the experimental psychology of perception and perceptual development. (Spring)

295 **Independent Research in Psychology** (3) **Staff**
Individual library or experimental research under supervision of staff member. Arrangements must be made with sponsoring faculty member prior to registration. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy major field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

Professors D.S. Brown, W. Sommers *(Emeritus)*, S.R. Chitwood, M.M. Harmon
Professorial Lecturers H.M. West III, B.T. Pitsvada, L. Taylor, D.R. Collins
Associate Professors B.L. Catron, A.E. Merget *(Chairman)*, S.J. Tolchin, C.W. Washington, L.H. Truong, W.C. Adams, K. Newcomer
Associate Professorial Lecturer E. Markham

See the School of Government and Business Administration for programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Public Administration.

Second Group

125 **Managing Public Policy** (3) Newcomer
Contemporary concepts and issues in public administration and management. Major trends and approaches to governmental administration in the U.S., including the changing federal role, roles of the public sector in relation to the private sector, and managing public agencies at all levels.

Third Group

205 **Introduction to Public Administration and Management** (3) Brown, Harmon, Truong
Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

212 **Legislative Management** (3) Tolchin
Analysis of Congress as a management system; examination of its internal administration and its role in formulating policy through legislation. Executive-legislative relationships, staffing practices, budget processes, leadership, rules and procedures, oversight functions, and the management of foreign policy are examined. (Fall)

213 **Administration in the Federal Government** (3) Tolchin
Critical analysis of the structure and administration of the federal

government from both a managerial and political perspective. Emphasis on executive branch organization, integration, and coordination, as well as current trends in government regulation, accountability, and effectiveness. (Fall and spring)

215 **Law and the Public Administrator** (3) Chitwood
Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historical and jurisprudential dimensions of American law. This broad perspective seeks to convey understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring)

216 **Federal Government Regulation of Society** (3) Tolchin
Analysis of the federal regulatory process as it affects the public and private sector. Specific problems involving presidential management, systemic failures, dejudicializing the regulatory process, policy conflicts, reform efforts, legislative oversight, and economic deregulation. Emphasis is placed on new solutions. Same as BAd 203. (Spring)

217 **Seminar: Development Administration I** (3) Truong
The nature of underdevelopment. Specific problems of less developed countries. National cultures and political and administrative systems. The giving of assistance: types of foreign aid; problems of working with aid givers. (Fall)

218 **Seminar: Development Administration II** (3) Truong, Brown
Problem of the transfer of administrative capability from one country to another. Political and administrative development. Unilateral and multilateral approaches. The role of the innovator. Strategies of administrative development. (Spring)

221 **Organization Theory and the Public Sector** (3) Catron, Harmon, Washington
Analysis of organization theory with special focus on public organizations; current issues in organization theory; decision-making, the organizational environment and the changing nature of organizations in a post-industrial society. (Fall and spring)

223 **Behavioral Factors in Large and Complex Organizations** (3) Brown
Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns; dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations; influence and control systems. Future trends. (Fall and spring)

224 **Managerial Leadership in Complex Organizations** (3) Brown
What the manager must know and do to provide leadership and guidance in large, complex organizations. Subjects explored include program planning and the supervision and direction of staff so as to achieve organizational objectives. (Summer)

231 **Public Personnel Administration** (3) Truong, West
Basic principles, legislative and judicial background, and currently significant practices in personnel administration in the public service. Roles of recruitment, selection, wage and salary administration, employee development, and other personnel functions. (Fall)

232 **Current Issues in Public Personnel Management** (3) Sommers, Truong, West
Analysis of major personnel management problems in government: labor-management relations, affirmative action for equal employment opportunity, impact of legislation and court decisions on trends in personnel policies, and other continuing problems. (Spring)

233 **Seminar: Manpower Planning, Development, and Utilization** (3) West
Examination of public and private manpower trends, problems, policies, and programs. Exploration of approaches to the analysis and administration of manpower programs. Analysis of impact of economic, political, and social factors on manpower. (Fall)

235 **Seminar: Technology Change and Professional Human Resource Planning** (3) Frame, Roman
Addresses human resource problems arising from automation and other technological changes. Evaluation of these developments in government, business, and educational organizations, and their implications for productivity, employment, training, and education. Analysis of economic, political, and social factors influencing public and private human resource policies. (Spring)

236 **Labor-Management Relations in the Public Sector** (3) Collins
Principles and current issues in public sector labor relations; collective bargaining and the merit concept, scope of bargaining, representation elections, unfair practices, grievance procedures, bilateralism and the management process. (Spring)

242 **Administration of State and Local Governments** (3) Washington
Examination of state and local governmental structures and functions, their place within the federal system, their revenue sources, their limitations, and the alternatives available to encourage more effective administration to meet public and private demands. (Fall and spring)

245 **Intergovernmental Relations** (3) Washington
Assessment of the impacts and consequences of changes in the administration of intergovernmental policies and programs in the federal system. Legislation, roles and responsibilities of federal, state, regional and local systems will be examined from both theoretical and practical vantage points.

246 **Dynamics of Citizen Participation in Administration** (3) Taylor, Merget
Review of the basic theory and principles of democracy in the American system of governance. Analysis of the nature of participation in a pluralistic society, including the characteristics and dynamics of citizen-based organizations. Exploration of effective methods or models by which citizens may contribute to administration. (Summer)

248 **Financing Local Government** (3) Merget
Analysis of the theory and practice of public finance in local governments. Includes the financing of services through municipal taxation, intergovernmental funds, debt instruments, and other revenue sources. Review of local expenditures as well as financial management practices. (Spring)

249 **Urban Public Policy** (3) Washington
Examination of selected national policies and their effects on urban areas and governments. Emphasis on policy dimensions of urban systems and their relationship to the social, political, and economic context. Against the background of urban politics and administration, areas of health, education, welfare, manpower, transportation, and housing will be addressed. (Spring)

251 **Governmental Budgeting** (3) Merget, Pitsvada
Survey of the basic concepts, principles and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process. (Fall and spring)

252 **Public Expenditure Analysis and Planning** (3) **Merget**
Intensive analysis of the concepts and principles of economics as applied to the public sector and the analytic techniques used by government agencies for planning, allocating, and managing scarce resources in the implementation of public programs. Topics discussed include benefit-cost analysis, program budgeting, productivity, and performance measurement. (Fall and spring)

253 **Public Financial Management Within Federal Agencies** (3) Markham
Intensive analysis of the concepts, principles, and general practices of financial management within federal departments and agencies, focusing on the interrelationships of financial and program functions and drawing on the several financial disciplines of budgeting, accounting, and auditing. (Spring)

260 **Policy Formulation and Administration** (3) Tolchin
Impact of economic and political factors on public policy formulation and implementation; intensive analysis of the analytical, normative, and decision-making models of the policy process, with special emphasis on their relationship to current policy problems. (Fall and spring)

261 **Policy Analysis in Public Administration** (3) Catron, Newcomer
Current issues in public policy analysis. Conceptual problems encountered in policy analysis. The role and limits of analytic techniques in the development, implementation, and evaluation of public policy. (Fall and spring)

262 **Seminar: Science, Technology, and Public Policy** (3) Black
The impact of science and technology upon public administration in terms of both administrative practice and national policies. (Spring)

264 **Public Program Evaluation** (3) Newcomer
Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation, considering economic, political, social, and administrative factors. Examination of methodological considerations for design, data collection, analysis, and dissemination. (Spring)

267 **Cases in Public Policy** (3) Catron
Critical analysis of topical issues in public policy, using a case-study approach. Specific issues covered will vary. Designed principally for MPA students in the last half of their program. (Fall)

280 **Purchasing and Materials Management** (3) Sherman
(Formerly PAd 279)
Same as BAd 280.

281 **Procurement and Contracting** (3) Sherman
(Formerly PAd 280)
Same as BAd 281.

282 **Government Contract Administration** (3) Sherman
Same as BAd 282.

283 **Pricing and Negotiation** (3) Sherman
Same as BAd 283.

285 **Systems Procurement and Project Management** (3) Sherman
Same as BAd 285.

288 **Field Problem Studies in Public Administration** (3) **Staff**
Field research and approved internships on selected issues and aspects of public administration, including specific policy and management problems arising in governmental agencies and related public

institutions. Open to Master's students upon completion of 9 hours toward the degree program and with the consent of the intern coordinator. (Fall and spring)

289 **Public Program Management and Policy Implementation** (3) Staff
A review of the diverse concepts and methods in public administration; an analysis and integration of the salient political, economic, managerial, and leadership values and issues in implementing public policies. Open only to MPA degree candidates in their final semester of study; serves as a capstone seminar to the MPA program. (Fall and spring)

290 **Special Topics in Public Administration** (3) Staff
Experimental course offering; new course topics and teaching methods. May be repeated once for credit.

292 **Telecommunication Administration** (3) Adams
Human factors in telecommunication innovations within a public organization. Federal role in research, development, and regulation of telecommunications. Acquisitions process for major systems in federal agencies. International telecommunication policies and controversies. Prerequisite: Mgt 244 or EE 251 or permission of instructor. (Spring)

295 **Research Methods** (3) Adams, Newcomer
Theory and practice in research methodology. Data sources and gathering, research models and designs. Critical evaluation of research studies. Emphasis on application of research methods to policy questions. (Fall and spring)

296 **Statistical Applications in Public Administration** (3) Adams, Newcomer
Use of statistics, computers, and SPSS in research and program evaluations. Emphasis on interpretation and use of statistics. Development of basic statistical competency; frequency distribution, sampling, central tendency, variability, correlation, probability, regression; computer assistance. Prerequisite: PAd 295 or permission of instructor. (Fall and spring)

298 **Directed Readings and Research in Public Administration** (3) Staff
Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy and methodology in public administration.

300 **Thesis Research** (3) Staff

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to other graduate students at the discretion of the department or the instructor.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

323 **Seminar: The Large and Complex Organization** (3) Brown
Unique problems of large, complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Merget, Washington
Supervised in-depth study of contemporary literature in selected fields and of research methodology in public administration.

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behavioralism, humanism, existentialism and phenomenology.

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to foundations of public policy with focus on theoretical problems of social action. Interrelation of theory and practice. Decision and management as human actions.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Public Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Public Administration candidates. May be repeated for credit.

PUBLIC POLICY—GRADUATE PROGRAMS

Doctoral Committee on Public Policy

A.V. Adams *(Chairman)*, E. Berkowitz, D. Klingman, C.J. Lange, T.Z. Lavine, J.M. Logsdon, C.E. Rice, C.T. Stewart, P.L. Stewart

The Graduate School of Arts and Sciences offers interdisciplinary programs leading to the degrees of Master of Arts and Doctor of Philosophy in the field of public policy. The master's program allows students to concentrate in one of five policy areas: environmental and resource policy, gerontology, philosophy and social policy, telecommunications policy, or women's studies. The doctoral program, intended for those wishing to pursue academic or policy-making careers, is concerned with policy research and analysis; students may select an applied field of study in education policy, employment policy, health policy, natural resources and the environment, or science and technology.

Master of Arts in the field of public policy—required: the general requirements stated under the Graduate School of Arts and Sciences. For specific concentration requirements, consult the listing under the specific policy area.

Doctor of Philosophy in the field of public policy—Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) a pre-qualifying core curriculum consisting of Econ 221-22; Soc 241, 252; PSc 203 and one course chosen from PSc 216, 217, or 218; and OR 235 and 236 *(Analytic Methods for Management and Public Policy I and II)*; (2) a written qualifying examination; (3) a post-qualifying core consisting of Phil 198, Soc 776 *(Public Policy Research)*, and an advanced social science research methods course; (4) a minimum of 18 hours related to one of the five policy fields; (5) completion of the tool requirement through course work in two of the following: statistics, computer programming, and historical research methods; and (6) completion of the general examination in the form of a public policy paper.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit.

RADIOLOGICAL SCIENCES—GRADUATE PROGRAMS

Committee on Radiological Sciences

W.C. Eckelman *(Chairman)*, V.H. Cohn, J.B. Levy, R.C. Reba, S.O. Schiff

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of radiological sciences. The program is directed by a committee whose members are drawn from the Departments of Radiology, Pharmacology, Chemistry, and Biological Sciences.

Applicants should have a baccalaureate degree in chemistry, physics, pharmacy, or the biological sciences. Graduate Record Examinations are required for Ph.D. degree applicants and recommended for M.S. applicants. The undergraduate program must have included two semesters each of organic chemistry, physical chemistry, and general biology, and one semester of quantitative analysis.

Master of Science in the field of radiological sciences—Required: the general requirements stated under the Graduate School of Arts and Sciences. The 40 semester hours required for this program must include: Rad 190; Bioc 221–22; Phyl 191; Stat 127; RSci 201, 220, 221, 230, 240, and 241; Phar 203; and six hours of RSci 299–300.

Doctor of Philosophy in the field of radiological sciences—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study must include: Rad 190; Bioc 221–22; Phyl 191; Stat 127; RSci 201, 220, 221, 230, 240, 241, and 250; Chem 235 and 236; and Phar 203. The tool requirements may be met by the satisfactory completion of an approved course in statistics other than Stat 127 and one foreign language or a course in computer programming.

RADIOLOGICAL SCIENCES

201 Nuclear- and Radio-chemistry (3)
An introduction to the structure of matter and radioactive decay. Covers concepts of radioactive decay and growth, interaction of radiation with matter, radiation detection and measurement, statistical considerations, tracers in chemical applications, radioactive decay processes, and nuclear models.

220 Radiopharmaceuticals (3)
An introduction to the chemistry and mechanism of action of radiolabeled tracers used in clinical nuclear medicine including the chemistry of technetium, indium, and the halogens and radiopharmaceuticals for specific organs and organ systems such as lung, bone, bone marrow, heart, kidney, and liver.

221 Preparation of Radiopharmaceuticals (1)
A laboratory course taught in conjunction with RSci 220, involving the preparation of radiopharmaceutical kits used in clinical nuclear medicine.

230 Radioimmunoassay (2)
A review of the current methods used in radioreceptor assay and radioimmunoassay. Topics covered include iodination, antisera preparation, separation of bound from free antigen, solid-phase antibody systems, methods involving labeled antibodies, extraction and concentration of hormones from physiological fluids, and mathematical treatment of data and automation.

240 Chromatographic Techniques (3)
An introduction to separation sciences with emphasis on separation

equilibria, diffusion and mass transport, operational aspects of separation, chromatography, characteristics of individual separation methods, distillation, gas-liquid chromatography, solvent extraction, liquid-liquid chromatography, crystallization, ion-exchange separation processes, liquid-solid adsorption chromatography, and quality assurance.

241 **Laboratory: Chromatographic Techniques and Quality Assurance** (1)
Laboratory to accompany RSci 240.

250 **Seminar in Radiopharmaceutical Chemistry** (1)
Invited lectures by research groups in radiopharmaceutical chemistry.

260 **Special Topics in Radiological Sciences** (2 or 3) Staff
Selected aspects of radiopharmaceutical chemistry. Content differs each time the course is offered. Emphasis on the chemistry of radionuclides at low concentrations.

295 **Reading and Research** (arr.)
Independent study for students preparing for the Master of Science degree.

299–300 **Thesis Research** (3–3)
(Fall and spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examinations.

399 **Dissertation Research** (arr.)
May be repeated for credit.

CHEMISTRY

221 *Advanced Analytical Chemistry I* (3)
222 *Advanced Analytical Chemistry II* (2 or 3)
233 *Organometallic Chemistry* (3)
235–36 *Advanced Inorganic Chemistry* (3–3)
251–52 *Advanced Organic Chemistry* (3–3)
257 *Physical-Organic Chemistry* (3)
258 *Synthesis and Structure Determination in Organic Chemistry* (3)

PHYSIOLOGY

191 *Selected Topics in Human Structure and Function* (3)
201 *Physiology* (8)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology and Toxicology* (3)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)
260 *Endocrine Pharmacology* (1)
269 *Pharmacology Seminar* (1)
275–76 *Advanced Topics in Pharmacology I-II* (1–1)
277–78 *Advanced Topics in Pharmacology III-IV* (1–1)

BIOLOGY

167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)

BIOCHEMISTRY

221–22 *General Biochemistry* (3–4)

STATISTICS

127 *Statistics for the Biological Sciences* (3)

REGULATORY POLICY—GRADUATE PROGRAM

Academic Director R.E. Park

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Science in the field of regulatory policy. This program is designed to provide a knowledge of relevant institutional aspects of regulatory policies and procedures and to develop analytical capabilities for participation in and evaluation of these policies and procedures.

Master of Science in the field of regulatory policy—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Econ 217, 245, 246, 247; Hist 222; PSc 203, 217; RPol 210, 220, 230, 280; Stat 111. All students must pass a Master's Comprehensive Examination.

210 **Administrative Law for Non-Lawyers** (3)
Legal standards governing decision-making in the executive and independent regulatory agencies. Major topics include: judicial review, adjudication, formal and informal rule-making, due process, executive discretion, and evidentiary standards.

220 **Regulated Industries** (3)
Planning, promotion, and policing of the behavior of firms through regulation. Economic justifications for regulation and deregulation. Judicial review of regulatory agency decisions.

230 **Evidence in the Regulatory Process** (3)
Regulatory agency hearings and comment procedures. Preparation of exhibits and testimony. The relation of attorneys and economists in case preparation. Coordination of economists, engineers, accountants, geologists, and other experts. Cross-examination of expert witnesses. Standards of evidentiary proof. Evidentiary issues in appellate advocacy and judicial review.

280 **Seminar: Current Topics in Regulation** (3)

RELIGION

Professors R.G. Jones, H.E. Yeide, Jr. *(Chairman)*, D.D. Wallace, Jr., A.J. Hiltebeitel
Associate Professor D.A. Altshuler
Associate Professorial Lecturer E.S. Jospe
Assistant Professor S.A. Quitslund

Bachelor of Arts with a major in religion (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken to satisfy the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—six hours from among Rel 9, 10, 59, 60.
3. Four required courses in related areas—(a) six semester hours in studies of cultures other than American and English (preferably a foreign language), and (b) six semester hours in either literature, philosophy, or history.

4. Required courses in the major—thirty semester hours including at least twenty-one hours of upper-level courses. Twelve of these hours must be chosen from one of the following religious traditions: Judaism (Rel 103, 107, 113, 114, 115, 116, 174, 184), Christianity (Rel 104, 105, 122, 124, 143, 144, 145, 146, 172), religions of India (Rel 157, 158, 159, 160, 162). Appropriate graduate seminars may be approved as substitutions for advanced-level courses. The program must include Rel 101 and at least one course in each of the following areas: Hebrew Scriptures, New Testament, Eastern religions, Western religions.

An honors thesis course (Rel 191) is available for eligible students.

It is recommended that students include the study of foreign languages in their undergraduate program, including Hebrew for those specializing in Judaism and biblical studies, Greek for those specializing in early Christianity (including the New Testament), Sanskrit for those specializing in the religions of India. All students expecting to enter graduate school are urged to study French or German.

Minor in religion—Required: a minimum of 18 semester hours in religion, of which at least 6 must be upper-level courses. The minor program will be developed in consultation with the departmental advisor. Rel 101 is recommended for all participating students.

Master of Arts in the field of religion—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12 must be in third-group religion courses; a maximum of nine may be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields (the thesis research must be on one of these three fields) selected from the following: the Old Testament, the New Testament, history of Christianity, Judaism, history of religion in America, modern religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required; however, Hebrew or Greek is acceptable for those students whose thesis area is in the Biblical field and Sanskrit or an Eastern language for those whose thesis area is in the history of religions.

Master of Arts in the field of religious education—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree. The undergraduate program should have included the following courses or equivalent: Anth 2; Educ 108; Psyc 1, 22, and 29; SpDr 1 or 11.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 semester hours of required courses (exclusive of the thesis), at least six must be in third-group religion courses; a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

Master of Arts in the field of religion and medical care—Prerequisite: (1) the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree; or (3) acceptable academic work required of entering medical students who have not earned a bachelor's degree, but who are pursuing the degree of Doctor of Medicine. Certain courses in this program are offered only through off-campus centers of the Division of Continuing Education and Summer Sessions.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work with or without a thesis. Students must elect course work covering four fields selected from clinical pastoral care, religion, sociology,

psychology, health services administration, and medicine. The course work in these fields must be distributed as follows: 12 semester hours each selected from two fields and at least six hours in clinical pastoral care. The Master's Comprehensive Examination must cover three fields selected from the list above, one of which, as approved by the department, must be outside of the Department of Religion. Supervised clinical education may be offered as a tool subject in lieu of the required reading knowledge examination in a foreign language.

Master of Arts in the field of history of religions—Hinduism—(Consortium of Universities program). Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. The Master's Comprehensive Examination must cover the following: methods in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A reading knowledge examination in a foreign language, usually in French or German, will be required, and a student must take at least two semesters of either Sanskrit or Hindi in addition to the 30 hours of required courses for graduate credit. More complete information regarding courses and requirements is available from the program advisor, Professor A.J. Hiltebeitel, Department of Religion.

Doctor of Philosophy in the field of American religious history (offered in cooperation with the Department of History)—Required: the general requirements stated under the Graduate School of Arts and Sciences. The General Examination must cover four fields, including two from the Department of Religion (history of religion in America and either early Christianity or European Christianity since 1500) and two from the Department of History (generally American social history and one other).

First Group

9 **The Hebrew Scriptures** (3) **Jones**
Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities. (Fall and spring)

10 **The New Testament** (3) **Jones**
Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles. (Fall and spring)

21 **Religion and the Human Search for Meaning** (3) Yeide
Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society. (Fall)

22 **Religion and Contemporary Social Issues** (3) Yeide
Illumination of social problems by ethical reflection; examination of religious perspectives as stimuli and barriers to social change; techniques for maintaining social values and seeking change. (Spring)

23 **Judaism: Identities and Ideas** (3) **Altshuler**
Exploration of important practices and beliefs in classical and mod-

ern times; study of people and texts that confront tradition and background. (Fall and spring)

59 **Religions of the East** (3) **Hiltebeitel**
Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto. (Fall and spring)

60 **Religions of the West and Near East** (3) Quitslund, Wallace
History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments. (Fall and spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Theories in the Study of Religion** (3) **Staff**
Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be approached. Readings and discussion of some of the epoch-making books in the development of the study of religion. (Fall)

103 **The Prophets** (3) **Quitslund**
Development of the prophetic movement in Israel; cultural, economic, literary, and religious dimensions; elements of lasting value in the prophetic teaching. Study of selected prophets. (Fall)

104 **The Life and Thought of Jesus** (3) **Quitslund**
Comprehensive study of the life and teachings of Jesus with critical attention to sources. Quest for the historical Jesus.

105 **The Life and Thought of Paul** (3) Quitslund
Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul, Paul's presentation of the Christian faith. (Spring)

107 **Rabbinic Literature and Thought** (3) **Altshuler**
Readings of the Mishna, Tosefta, Talmuds, midrashim, and liturgical works in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects. (Fall)

111 **Myth, Epic, and Novel** (3) Hiltebeitel
Religious themes and images of the hero and their cultural significance in literature: e.g., Indo-European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett.

113 **Early Post-Biblical Judaism** (3) **Altshuler**
History of Judaism from the time of Ezra through the destruction of Jerusalem in 70 CE—canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings. (Fall)

114 **Judaism in the Rabbinic Period** (3) **Altshuler**
From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple; apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman au-

* An interdepartmental course offered by the Departments of Religion, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Political Science.

thority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature. (Spring)

115 **Judaism in the Medieval World** (3) Altshuler
History of relations between Jews and non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects and messianic movements.

116 **Judaism after Emancipation** (3) Altshuler
Transformation of community and beliefs among Jews beginning with catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America, and Israel.

122 **Christian Ethics and Modern Society** (3) Yeide
Nature and principles of Christian life as developed by the Christian community; problems of personal conduct; application to family, social, and economic institutions.

124 **Contemporary Movements in Theology** (3) Quitslund
Theological approach and systems of a selected number of modern theologians and/or theological movements such as process theology, liberation theology. (Fall)

126 **Western Mysticism** (3) Quitslund
Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam.

127 **Medicine, Religion, and Healing** (1) Yeide
Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious prespective on issues in medical ethics. (Spring)

137 **The Land of Israel and the Growth of the Western Religions** (6) Staff

143 **Early Christianity and the Spiritual Life of the Ancient World** (3) Wallace
Rise and development of Christianity in relation to the culture, philosophy, mystery religions, and general religious life of the Greco-Roman world to A.D. 500. (Fall)

144 **Medieval Faith and Symbolism** (3) Wallace
Christian life and thought in the Middle Ages; mystics, saints, popes, and philosophers. (Spring)

145 **Religious Currents in the Renaissance and Reformation** (3) Wallace
Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason.

146 **Christianity in the Modern World** (3) Wallace
Changes in Christian life and thought since 1700 as seen in theology, literature, political life, and religious institutions.

155 **Anthropological Approaches to Religion** (3) Simons, Wagner
Same as Anth 155.

157 **Indian Philosophy and Mysticism** (3) Hiltebeitel
Indian speculative and mystical traditions; late *Vedas*, *Upanishads*, *Bhagavad Gita*, Buddhist, and Hindu soteriological systems. (Fall)

158 **Ancient Indian Literature and Religion** (3) Hiltebeitel
Studies of foundational texts of Hinduism, especially *Rig Veda*, *Brahmanas*, *Mahabharata*, (including the *Bhagavad Gita*); attention to Hinduism's archaic and seminal themes. (Spring)

159 **Mythologies of India** (3) Hiltebeitel
The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy

men (Hindu, Buddhist, Jain, Tantric); ties with Indian caste, cult, cosmology, and spiritual ideals.

160 **Buddhism** (3) **Hiltebeitel**
Origin, development, and contemporary status of Buddhist life and thought; its impact on the Near East.

161 **Islam** (3) Staff
Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East. (Spring)

162 **Symbolism in the History of Religions** (3) Hiltebeitel
Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses. (Spring)

172 **Religion in American Culture** (3) **Wallace**
Growth of religious bodies and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene. (Fall)

174 **American Judaism** (3) **Altshuler**
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community dynamics. (Spring)

181 **Women in Western Religion** (3) Quitslund
Historical, theological, and ethical investigation of the image and role of women in Judaism and Christianity; special consideration of the Biblical experience, the sexual qualifications for religious office, use of male-female images and languages, and contemporary issues.

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300–1800)
Same as Engl/Fren/Ger/Hist/Phil 183 and Art 187.

184 **The Thought of Martin Buber** (3) **Jospe**
Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm.

191 **Senior Honors Thesis** (3) **Staff**
Required of and open only to undergraduate honors candidates in religion. (Fall and spring)

Third Group

209–10 **Seminar: Biblical Studies** (3–3) **Jones**
Main problems of Biblical literary, historical, and theological criticism. (Rel 209—fall)

213 **Seminar: Judaism in Late Antiquity** (3) **Altshuler**
Selected topics. (Spring)

*216 **Supervised Clinical Pastoral Education (I–A)** (6) Staff

*217 **Supervised Clinical Pastoral Education (I–B)** (6) Staff

*218 **Supervised Clinical Pastoral Education (III–A)** (6) Staff

*219 **Supervised Clinical Pastoral Education (III–B)** (6) Staff

222 **Seminar: Ethics** (3) **Yeide**
Selected topics.

*223 **Religious and Ethical Perspectives on Medical Problems** (3) Yeide

*225 **The Dynamics of Ministering to the Young Adult** (3) Staff

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* Offered through the Division of Continuing Education and Summer Sessions at off-campus centers for students in the master's degree program in the field of religion and medical care. Offered as the demand warrants.

235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslund
Important leaders and their ideas in selected developments since 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical. Emphasis on 20th century.

237 **Seminar: Theological Analysis** (3) Quitslund
Historical and topical study of the development of important ideas in such areas as Christology, ecclesiology, and death. (Spring)

238 **Seminar: Contemporary Judaism** (3) Altshuler
Selected topics.

262 **Seminar: History of Eastern Religions** (3) Hiltebeitel
Selected topics. (Fall)

271 **Seminar: American Religious History to 1830** (3) Wallace
Religious thought and life during the Colonial and early National period. (Spring)

273 **Seminar: American Religious History since 1830** (3) Wallace
Religious thought and life from the Civil War to the present.

291–92 **Readings and Research** (3–3) Staff
Investigation of special problems. (Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ROMANCE LANGUAGES AND LITERATURES

Professors J.W. Robb, G.E. Mazzeo, J.A. Frey *(Chairman)*, J.F. Burks
Associate Professors M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnett, I. Azar, J.M. Thibault
Assistant Professors G.P. Huvé, J.E. Hicks

Bachelor of Arts with a field-of-study major in (1) French language and literature, (2) Spanish language and literature, (3) Spanish-American literature, or (4) any approved combination selected from two of the preceding fields—The following requirements must be fulfilled:

1. **The general requirements stated** under **Columbian College of Arts and Sciences.** (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses—Fren 1–2, 3–4, 9–10, or equivalent; or Span 1–2, 3–4, 9–10, or equivalent.

3. Required introductory literature courses—Fren 51–52 or 91–92, or Span 51–52 or 91–92.

4. Required for the major:

There is no specific program of required courses. The student, however, is expected to demonstrate a knowledge of his or her field in breadth and depth by passing a comprehensive examination at the end of the senior year. A proseminar is required as follows: Fren 199–200 for French language and literature majors; Span 199–200 for Hispanic language and literature majors.

Minor in French or Hispanic languages and literatures—Required: 6 semester hours of French or Spanish 51–52 or 91–92; 12 additional hours selected from among French or Spanish courses numbered 9 and above.

Master of Arts in the fields of (1) French literature, (2) Spanish literature, (3) Spanish-American literature, or (4) an approved combination of Spanish and Spanish-American literatures—Prerequisite: the degree of Bachelor of Arts in the appropriate field from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours), or, with the approval of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Doctor of Philosophy fields of study in Romance literatures –Required: the general requirements stated under the Graduate School of Arts and Sciences. There are four fields: French literature; Spanish literature; Spanish-American literature; and any approved combination of French, Spanish, or Spanish-American literature.

Bachelor of Arts in Education and Human Development with teaching fields in French and in Spanish—Prerequisite: the education curriculum; required: the French option or the Spanish option and the professional courses stated under the School of Education and Human Development.

Placement Examinations: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

Departmental prerequisite: Fren 3–4 or 6, or equivalent, is prerequisite to all courses in French, from Fren 9 and above, except for courses offered in English translation.

First Group

1–2 **First-year French** (3–3) Frey and Staff
A year course; credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Fren 1 and 2—fall and spring)

3–4 **Second-year French** (3–3) Frey and Staff
A year course; credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2. Laboratory fee, $17.50 per semester. (Fren 3 and 4—fall and spring)

6 **Second-year French** (6) Frey and Staff
Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Fren 3–4. Prerequisite: Grade of *B* or better in Fren 2. Laboratory fee, $17.50. (Fall and spring)

9–10 **Third-year Oral and Written French** (3–3) Huvé and Staff
Readings, study of vocabulary and syntax, discussion of texts, oral reports, dictations, oral and written grammar exercises, compositions. Prerequisite: Fren 4 or equivalent. (Fren 9 and 10—fall and spring)

49 **French for Graduate Students** (0) Staff
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of French Literature** (3–3) Thibault, Frey
Readings in French literature from the Middle Ages to the present. Lectures, readings, and informal discussions. (Academic year)

60 **Contemporary French Civilization** (3) Ludlow
Study of contemporary France as seen through its cultural, political,

economic and social life, its geography, language, population and character. Class lectures and discussion of texts supplemented by slides, films, tapes and records. Conducted in English. (Summer)

91–92 **Analyse de texte** (3–3) Thibault and Staff
Methodology and vocabulary of literary criticism; application of principles of *explication de texte* to selections from prose, drama, and poetry from the Renaissance to the present. (Academic year)

Second Group

103 **Oral French With Emphasis on Pronunciation** (3) Huvé
The sounds of French; elements of phonetics. Exercises in reading and conversation with attention to accent, rhythm, and intonation. Prerequisite: Fren 10. (Spring)

108 **Advanced French Grammar** (3) Thibault
Compositions, drills, dictations. Translations into French. Prerequisite: Fren 10. (Fall)

109–10 **Advanced Oral and Written French** (3–3) Huvé and Staff
Readings and discussions based on French culture and civilization. Study of vocabulary and syntax with emphasis on stylistic devices. Oral reports with emphasis on diction. Dictations, translations, compositions. Prerequisite: Fren 10 or equivalent. (Academic year)

111 **Advanced French Conversation: The Language of Government, Politics, and Economics** (3) Huvé
Discussions and questions based on recent articles from the press. Emphasis on vocabulary, pronunciation, syntax, and translations. (Summer)

119–20 **French Literature of the Middle Ages and the Renaissance** (3–3) Staff
Literary history and the development of ideas. *Les chansons de geste*, courtly literature, satire, the theater, lyric and didactic poetry; Rabelais, Montaigne, *La Pléiade*. Class analysis of texts, collateral readings. (Academic year)

121–22 **17th-Century French Literature** (3–3) Burks, Ludlow
Drama, fiction, poetry, criticism, and philosophy in the Age of Classicism. (Academic year)

123–24 **18th-Century French Literature** (3–3) Ludlow
Fren 123: Study of the major French novelists and dramatists of the period; Fren 124: The contribution of Montesquieu, Voltaire, Diderot, and Rousseau to European and American thought of the period.

125–26 **19th-Century French Literature** (3–3) Thibault
Poetry, drama, novel, and criticism of the 19th century; emphasis on stylistic analysis. (Academic year)

127–28 **20th-Century French Literature** (3–3) Coffland
Fiction, poetry, and drama from 1900 to the present. Chronological examination of authors and movements.

130 **Correspondences between Art and Literature** (3) Thibault
Expression of common preoccupations in diverse media. Readings, slides, lectures, and informal discussions. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Summer)

133 **Seminar: French Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

151 **Cinema and Literature** (3) Thibault
Interaction between film and literature; aesthetic theories and their applications to film and literary genres. Selected films and readings. May be repeated for credit. (Summer)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
(Formerly 721, The Birth of Modernity, 1300–1800)
Same as Engl/Ger/Hist/Phil/Rel 183 and Art 187.

199–200 **Proseminar: Readings for the Major** (3–3) Thibault and Staff
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

202 **Thème et version** (3) Staff
Limited to graduate students; open to others only by permission of the instructor. Required of all graduate students in the field of French language and literature. Analysis and translation of selected prose passages, alternating between French and English; designed to teach students to write with precision and clarity.

213 **Medieval French Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. Study of the origins and development of modern French from its Latin beginnings through Old and Middle periods. Some knowledge of Latin is desirable but not necessary. May be repeated for credit.

214 **Seminar: Special Topics in Medieval French Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

221 **Special Problems in 16th-Century French Literature** (3) Burks
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

229–30 **Literary Renaissance in Europe** (3–3) Burks
Study of the developments in the poetry of Italy, France, and England.

231–32 **Theater in the 17th Century** (3–3) Burks
Survey of the development of theatrical arts and the drama. Research papers and reports.

234 **17th-Century Nondramatic Literature** (3) Ludlow
Study of the poetry, novel, and philosophical writings of the Baroque and Classical periods.

241 **The Age of Enlightenment in Europe** (3) Ludlow
The contribution of the *philosophes* to the intellectual evolution of France and Europe. Emphasis on the relations among French, English, and German thought. Readings in English and French. Specific topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

242 **Seminar: the French Novel and Theater in the 18th Century** (3) Ludlow
Major 18th-century French novelists and dramatists and a comparison of their work with that of some English and German writers of the period. Readings in English and French.

244 **Special Problems in 18th-Century French Literature** (3) Ludlow
Topic: Anglo-French literary relations, 1660-1800. May be repeated for credit.

253 **Special Problems in 19th-Century French Literature** (3) Frey, Thibault
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

264 **Seminar: Modern Period** (3) Coffland
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Spring)

265 **20th-Century French Theater** (3) Coffland
Survey of the development of the theater from 1900 to the present.

266 **20th-Century French Poetry** (3) Coffland
Background and development of poetry in the 20th century; *explication de texte* approach.

295 **Independent Reading and Research in French Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the Department of Romance Languages and Literatures.

301–10 **Folger Institute Seminars** (3 credits each) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ITALIAN

First Group

1–2 **First-year Italian** (3–3) Coffland and Staff
A year course; credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Second-year Italian** (3–3) Coffland and Staff
A year course; credit toward a degree at this University given on completion of Ital 4. Conversation, grammar review, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Prerequisite: Ital 1–2. Laboratory fee, $17.50 per semester. (Academic year)

9–10 **Italian Conversation and Composition** (3–3) Coffland and Staff
Prerequisite: Ital 4 or equivalent and permission of instructor. (Academic year)

11 **Italian through Opera** (0) Chambers
Conversational Italian presented through excerpts from operas and their libretti. Pronunciation and grammatical principles, vocabulary, and conversation. Tuition will be charged at the rate of one credit hour. (Summer)

Third Group

295 **Independent Reading and Research in Italian Literature** (arr.)
For students preparing for the Master of Arts or Doctor of Philosophy degree. May be repeated for credit. (Fall and spring)

PORTUGUESE

First Group

31–32 **Intensive Portuguese** (3–3) **Robb**
Prerequisite: knowledge of one other Romance language. (Academic year)

SPANISH

Departmental prerequisite: Span 3–4 or 6, or equivalent, is prerequisite to all courses in Spanish, from Span 9 and above, except for courses offered in English translation.

First Group

1–2 **First-year Spanish** (3–3) Barnett and Staff
A year course; credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Span 1 and 2—fall and spring)

3–4 **Second-year Spanish** (3–3) Hicks and Staff
A year course; credit toward a degree at this University given on completion of Span 4. Conversation, grammar review, composition, reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2. Laboratory fee, $17.50 per semester. (Span 3 and 4—fall and spring)

6 **Second-year Spanish** (6) Hicks and Staff
Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Span 3–4. Prerequisite: grade of *B* or better in Span 2. **Laboratory fee, $17.50. (Fall and spring)**

9–10 **Spanish Conversation and Composition** (3–3) Sáenz and Staff
Conversation, composition, vocabulary, and syntax. Prerequisite: Span 4 or equivalent. (Span 9 and 10—fall and spring)

12 **Spanish Conversation and Composition (Intensive)** (6) Sáenz and Staff
Intensive, accelerated course which covers the material of Span 9–10. (Fall and spring)

20 **Prensa y Cultura: Intensive Spanish Conversation** (3) Azar
Intensive conversation organized around specific contemporary topics; illustrated by periodical material, films and interviews. (Summer)

49 **Spanish for Graduate Students** (0) Staff
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of Spanish Literature and Civilization** (3–3) Barnett
Social, artistic, and cultural background of Spanish literature. Lectures, readings, recitations, and informal discussions. (Academic year)

91–92 **Explicación de Textos** (3–3) Sáenz
Analytical introduction to Spanish and Spanish-American literature.

Method demonstrated and practiced on selected passages. (Academic year)

Second Group

109–10 **Advanced Spanish Conversation and Composition** (3–3) Mazzeo
Development of writing and speaking skills. Emphasis on diction, grammar, and style. Prerequisite: Span 10 or equivalent. (Academic year)

119–20 **Medieval Spanish Literature** (3–3) Staff
Survey by genre of the literature of the Middle Ages.

121–22 **Spanish Literature of the Golden Age** (3–3) **Azar**
Span 121: poetry and drama; Span 122: prose. (Academic year)

123–24 **Cervantes: "Don Quijote"** (3–3) Azar
The *Quijote* and the novel as a literary genre: reality and fiction.

125–26 **Modern Spanish Literature** (3–3) **Mazzeo**
Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral readings, lectures on literature and history.

127–28 **Contemporary Spanish Literature** (3–3) **Sáenz**
Prose, poetry, and drama of the 20th century. Class analysis of texts, collateral readings, lectures on literature and history. (Academic year)

130 **The Modern Spanish Essay** (3) **Mazzeo**
Development of the Spanish essay from the 16th through the 20th centuries; emphasis on the 18th and 19th centuries. Class analysis of texts, collateral readings, and lectures. (Summer)

133 **Feminist Authors in Hispanic Literature** (3) **Mazzeo**
Development of feminist themes in Hispanic literature. Class analysis of representative works with readings in Spanish or in English translation. (Summer)

151–52 **The Spanish-American Novel** (3–3) **Robb**
Development of the novel in Spanish America. Lectures, collateral readings, and class analysis of texts. (Academic year)

155–56 **Spanish-American Literature to 1880** (3–3) **Robb**
Literature of Spanish America from the colonial period to the latter part of the 19th century. Lectures, collateral readings, reports, and class analysis of important works.

157–58 **Spanish-American Literature since 1880** (3–3) **Robb**
Literature of Spanish America from 1880 to the contemporary period. Lectures, collateral readings, reports, and class analysis of important works.

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** (3–3) Staff
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

215 **Seminar: Medieval Language and Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

221 **Seminar: Cervantes' "Don Quijote"** (3) **Azar**
Cervantes' literary theories, the *Quijote* and its relations with the other *novelas cervantinas* as different modes of representing reality in literary fiction.

224 **Seminar: "La Celestina"** (3) **Azar**

225 **Seminar: Special Problems in Golden-Age Literature** (3) Azar
Topic: fall—16th-century literature; spring—17th-century literature. May be repeated for credit. (Fall and spring)

231 **Seminar: 18th-Century Spanish Writers** (3) Mazzeo
Lectures and analysis of principal authors and works; relationships with subsequent literary movements. (Fall)

242 **Seminar: Spanish Romanticism** (3) Mazzeo
Lectures and analysis of principal authors and works. Collateral readings. Problems of origins and development. (Fall)

244 **Seminar: Naturalism and the Spanish Novel** (3) Mazzeo
Development of Naturalism in 19th-century Spain. Analysis of representative works of Pardo Bazán, Clarín, Blasco-Ibáñez and others.

246 **Seminar: Works of Galdós** (3) Barnett
Ideological and stylistic analysis: relationship of Galdós' works to literary movements of the second half of the 19th century.

248 **Seminar: Spanish Lyric Poetry of the 20th Century** (3) Sáenz
Stylistic analysis of the most significant poets from 1898 to the present.

250 **Seminar: Novecentismo y Literatura de Entreguerras** (3) Sáenz
The prose writers: intellectualism and new forms of expression. (Spring)

251 **Seminar: Works of Unamuno and Ortega y Gasset** (3) Sáenz
Study of the thought of Unamuno and Ortega y Gasset; analysis and commentary on the texts. (Spring)

252 **Spanish Literature since the Civil War** (3) Sáenz
Development of the Spanish novel since 1939.

253 **Seminar: Studies in Modern Spanish-American Poetry** (3) Robb
Poetic trends studied in selected poets and groups of poets from the Modernists through Post-modernists and Vanguardists to the present. (Fall)

255 **Seminar: Studies in 20th-Century Spanish-American Theater** (3) Robb
Trends in modern theater with emphasis on Mexico, Central America, Puerto Rico, Chile, and the Rio de la Plata area. (Spring)

256 **Seminar: Studies in Mexican Narrative Prose** (3) Robb
Study of the emergence and development of the "New Mexican Narrative" through the works of Yáñez, Rulfo, Arreola, Fuentes, Leñero, and others.

261 **Seminar: Studies in the Spanish-American Short Story and Essay** (3) Robb
The Spanish-American short story and essay as artistic forms; selected modern short story writers and essayists.

264 **Seminar: Studies in Recent Spanish-American Fiction** (3) Robb
The "New Spanish-American Narrative" studied in the novels and short stories of Borges, Bioy Casares, Cortázar, Vargas Llosa, García Márquez, Carpentier, Cabrera Infante, and others.

266 **Seminar: Alfonso Reyes: Essayist, Poet, Narrator** (3) Robb
Alfonso Reyes—essayist, poet, narrator and complete literary humanist—studied in his various prose and poetic works.

287 **Seminar: Problems in Latin-American Civilization** (3) Staff
Same as Anth/Econ/Geog/Hist 287, and PSc 285.

295 **Independent Reading and Research in Spanish and Spanish-American Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SANSKRIT

See **Germanic Languages and Literatures.**

SERBO-CROATIAN

See **Slavic Languages and Literatures.**

SERVICE-LEARNING PROGRAM*

Assistant Professors H. Nashman, N.C. Garner, D.J. Lynn, G.J. Povar, P.M. Palmer, H.B. Wagner *(Coordinator)*
Instructor P. Aron

151 **Urban Legal Services** (6) Aron
Field work combined with academic study of major concepts and issues underlying the urban legal system. Field placements (16-20 hours per week) in appropriate law-related organizations. Admission by permission of instructor. (Fall and spring)

152 **Issues in Education and Human Services** (6) Nashman
Exploration of the effects of education on society and vice versa; opportunities for experience, study, and service (16–20 hours per week) in public, private, museum, hospital, and community education centers. Admission by permission of instructor. (Fall and spring)

153 **Issues in American Health Care** (6) Povar and Lynn
Field work combined with academic study of present American health care system and its problems: cost, quality of care, delivery of health care, ethical issues, health education, consumer issues, etc. Field placements (16–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

154 **Independent Study** (3 or 6) Wagner
Field work combined with academic study, involving field-placements and complementary academic program of study, under the supervision of an appropriate faculty member. Students must "contract" with the agency, the faculty member, and the Service-Learning Program. Admission by permission of instructor. (Fall and spring)

155 **Issues in Managing the Arts** (6) Garner
Studies in the purpose and operation of the arts organizations in Washington. Weekly seminars and placement in an internship in an arts organization (16–20 hours per week). Discussion topics focus on the process of communication between artists and the public, the

* Administered by the Division of Experimental Programs.

government, and the business community. Open to students with a demonstrated interest in the arts and the maturity to perform in a responsible position in an arts organization. (Spring)

159 **Women and Public Policy** (6) Palmer
Field work combined with academic study of policy issues affecting women. Field placements (16-20 hours per week) in local and national women's organizations which work to influence public policy. Admission by permission of instructor. (Fall and spring)

700 SERIES— COURSES IN GENERAL AND INTERDISCIPLINARY STUDIES

Three sets of course numbers have been designated to identify new courses sponsored by this program in Columbian College, the School of Education and Human Development, the School of Engineering and Applied Science, the School of Government and Business Administration, the Graduate School of Arts and Sciences, the School of Medicine and Health Sciences, the National Law Center, and the School of Public and International Affairs.

701 (General Studies)
721 (Interdisciplinary Studies)
770s (University Professors)

In each case, the course title is completed by a brief description of the topic of the individual course. 700 Series courses change frequently; interested students should consult the *Schedule of Classes* for the current semester. The courses are listed with the other offerings of participating departments; course descriptions appear in the section on the 700 series.

The 701 number designates courses taught by individual faculty members. They explore topics not normally included in departmental offerings, or utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 721 number designates courses in which faculty from two or more departments investigate a topic of mutual academic interest. Courses numbers in the 770s are taught by scholars who hold appointments as University Professors. The program is coordinated through the Division of Experimental Programs.

SINO-SOVIET STUDIES

See **Institute for Sino-Soviet Studies.**

SLAVIC LANGUAGES AND LITERATURES

Professors C.A. Moser *(Chairman)*, N.N. Natov, W.W. Rowe *(Research)*
Associate Professors G.A. Olkhovsky, I. Thompson
Assistant Professors M.F. Miller, R.M. Robin *(Visiting)*
Assistant Professorial Lecturer **S. Ficks**

Bachelor of Arts with a major in Russian language and literature (field-of-study or departmental)—The following requirements must be fulfilled.

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—Slav 5–6 (preferred), or Slav 1–2, 3–4; or equivalent; and Slav 91–92.

3. Required for the major:

Field-of-study major—By the end of the senior year the student will be expected to have a good command of language skills and a grasp of the

fundamentals of Russian structure, as well as a good foundation in Russian literature and culture. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

Departmental major—from 30 to 36 semester hours of course work in the Department of Slavic Languages and Literatures distributed as follows: Language—12 to 15 hours chosen from Slav 9–10, 101–2, 103, 109–10, 125; Culture and Civilization—six hours (Slav 161–62); Literature in Russian—six hours chosen from Slav 141, 142, 151, 152; Literature in English Translation—six to nine hours chosen from second-group courses.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to six semester hours of second-group courses.

Bachelor of Arts with a major in Russian literature and culture—in translation (field-of-study)—The following requirements must be fulfilled.

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—Slav 47 and 49, or Slav 1–2 and 3–4, or equivalent; and Slav 91–92.

3. By the end of the senior year the student will be expected to have a good grasp of Russian literature and the principles of literary criticism, as well as a general knowledge of Russian culture and history. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to six semester hours of second-group courses.

Master of Arts in the field of Russian language and literature—Two areas of concentration are offered: Russian literature and Russian language.

Prerequisite: the degree of Bachelor of Arts with a major in Russian language and literature or Russian literature and culture—in translation from this University, or an equivalent degree. A student planning a concentration in Russian language must pass a Russian language entrance examination and must have a general knowledge of Russian literature and an acquaintance with Russian history and culture. A student planning a concentration in Russian literature must have a general knowledge of Russian literature, an acquaintance with Russian history and culture, and a general proficiency in the Russian language as demonstrated by the passing of a Russian language entrance examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. All candidates must pass a reading knowledge examination in French, German, or a Slavic language other than Russian; a Russian language proficiency examination upon completion of 15 semester hours of course work; and a Master's Comprehensive Examination. Additional specific requirements are:

Concentration in Russian language: 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) or 30 semester hours of approved course work without a thesis. The following courses are acceptable for the satisfaction of these requirements: Slav 152, 186, 211, 212–13, 215, 218, 220, 225, 241, 242, 295; and Slav 101–2, 103, with a translation project in consultation with a faculty member.

Concentration in Russian literature: 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) or 30 semester hours of approved course work without a thesis. Courses must include Slav 212–13 and at least 18 hours of literature.

Bachelor of Arts in Education and Human Development with a teaching field in Russian—Prerequisite: the education curriculum; required: the Russian option and the professional courses stated under the School of Education and Human Development.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

First Group

1–2 **First-year Russian** (3–3) Miller
Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 **Second-year Russian** (3–3) Miller
Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1-2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 **Intensive Beginning Russian** (6–6) Thompson and Staff
Classroom (7 hours), laboratory (1 hour). Beginners' intensive course in the fundamentals of Russian. Prerequisite to Slav 6: Slav 2 or 5. Laboratory fee, $17.50 per semester. (Academic year)

9–10 **Intermediate Russian Conversation and Composition** (3–3) Miller
Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor. (Academic year)

31–32 **Elementary Polish** (3–3) Staff
Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

41–42 **Elementary Serbo-Croatian** (3–3) Staff
Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 42: Slav 41 or equivalent. Offered if enrollment is sufficient.

47 **Beginning Russian for Reading** (3) Staff
For undergraduate and graduate students with little or no Russian who wish to acquire a reading knowledge of the language. No academic credit for graduate students. (Summer)

49 **Russian Reading** (3) Staff
Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Summer)

51–52 **Elementary Bulgarian** (3–3) Moser
Beginners' course in fundamentals of grammar and pronunciation. Prerequisite to Slav 52: Slav 51 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

71 **Soviet Civilization** (3) Olkhovsky
Survey of the Soviet Union's past and present development. Lectures, discussion, visual aids—in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) Moser
Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English. (Academic year)

Second Group

101–2 **Readings in the Soviet Press** (3–3) Ficks
Representative reading and translation of Soviet periodicals and

current publications in social sciences. Prerequisite: Slav 4, 6, 49, or permission of instructor.

103 **Scientific Russian** (3) **Ficks**
Representative readings in the major fields of Russian contemporary scientific literature. Prerequisite: Slav 4, 6, 49, or permission of instructor.

109–10 **Advanced Russian Conversation and Composition** (3–3) Staff
Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent. (Academic year)

125 **Special Problems in Russian** (3) Staff
Study of selected areas of Russian language, with emphasis on practical use. Prerequisite: two years of Russian or permission of instructor. (Summer)

128 **Dostoevsky: The Man and the Artist** (3) **Natov**
Sources and development of Dostoevsky's philosophical, religious, and aesthetic ideas. His influence on Russian and Western literature. Lectures, discussions, and reports—in English.

141 **Readings in 19th-Century Russian Prose** (3) Rowe
Reading of representative prose texts of the 19th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Fall, even years)

142 **Readings in 19th-Century Russian Poetry** (3) Rowe
Reading of representative lyric poetry of the 19th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Spring, odd years)

143–44 **The Russian Novel** (3–3) **Moser**
Study of representative novels of the 19th and 20th centuries—in English.

151 **Readings in 20th-Century Prose and Poetry** (3) Rowe
Reading and discussion of representative prose and poetry of the 20th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Fall, odd years)

152 **Russian Drama** (3) **Natov**
Readings of the most representative plays of the 19th and 20th centuries. Reports and class discussion—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Spring, even years)

153–54 **Russian Writers** (3–3) Staff
Reading and discussion of works of outstanding Russian writers of the 19th and 20th centuries—in English.

156 **Leo Tolstoy: His Life and Works** (3) **Rowe**
Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Russian literature and society. Lectures, reports, and classroom analysis of his major works—in English.

161–62 **Russian Culture** (3–3) **Olkhovsky**
Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports. (Academic year)

165 **Modern Russian Literature from the Revolution to World War II** (3) Natov
Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English. (Fall)

166 **Modern Russian Literature from World War II to the Present** (3) Natov
Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s and 1970s. Lectures, discussions, reports—in English. (Spring)

186 **The Russian Short Story** (3) Natov
Development of the Russian short story since 1800. Lectures, reports, and class discussion—in Russian. Prerequisite: Slav 9-10 or equivalent. (Spring, odd years)

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Conferences and group discussions. (Academic year)

Third Group

211 **Russian Phonology** (3) Thompson
Linguistic analysis of the phonology of standard contemporary Russian. An appropriate knowledge of Russian is required.

212 **Russian Syntax I** (3) Thompson
Linguistic analysis of the syntax of simple sentences in standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Fall)

213 **Russian Syntax II** (3) Thompson
Linguistic analysis of the syntax of compound sentences in standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Spring)

214 **Methodology of Teaching Russian** (3) Thompson
Survey of modern methods, techniques, and materials for teaching Russian as a foreign language. Examination of textbooks, classroom observation, practice teaching. Prerequisite: 18 semester hours of Russian language.

215 **Russian Historical Grammar** (3) Moser
An analysis of the historical development of Russian phonology, morphology, and syntax. An appropriate knowledge of Russian is required. (Fall, odd years)

218 **History of the Russian Literary Language** (3) Moser
The development of the norms of the Russian literary language from earliest times to the present. An appropriate knowledge of Russian is required. (Spring, even years)

220 **Russian Stylistics** (3) Natov
Analysis of various styles of contemporary Russian from the point of view of vocabulary and structure—in Russian. (Spring, odd years)

224 **Russian Literature to 1800** (3) Moser
Survey of Russian literature from the earliest times to the end of the 18th century. Appropriate knowledge of Russian required.

225 **Pushkin and the Poets of his Time** (3) Natov
Pushkin's predecessors; Pushkin's poetry and drama; Lermontov, the heir to Pushkin's poetic tradition—in Russian. (Fall, odd years)

241 **Russian–English Oral Translation** (3) Olkhovsky
(Formerly Slav 181)
Training in the special skill of oral translation from Russian into English. Prerequisite: Slav 109–10, or equivalent.

242 **Advanced Spoken Russian** (3) Olkhovsky
Advanced training in the spoken Russian language. Prerequisite: Slav 109–10, or equivalent.

253 **Seminar: Literary Criticism** (3) Natov
Study of leading Russian critics and their role in the development of Russian literature; the emergence of various literary schools—in Russian. (Spring, even years)

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3) Moser
Discussion of literary and intellectual developments in the Russia

of the 1860s. Appropriate knowledge of Russian required. (Spring, odd years)

255 Seminar: Main Trends in 20th-Century Russian Literature (3) Natov
Study of representative works since 1900; their artistic and social value—in Russian. (Fall, even years)

295 Independent Reading and Research (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)
(Fall and spring)

SOCIAL AND ORGANIZATIONAL BEHAVIOR—GRADUATE PROGRAM

Academic Committee: J.N. Mosél, G.D. Wiggs

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Arts in the field of social and organizational behavior. The program objectives are to provide students with 1) the conceptual framework for understanding interpersonal and social relationships, particularly within an organizational setting; 2) an appreciation for the role of effective communication and a knowledge of the techniques of counseling and group function; 3) an understanding of the sociology of work, and its impact on organizational structure, personnel retention, program development, and career growth; and 4) a background in social systems, the nature of leadership, and the process of organizational change.

Master of Science in the field of social and organizational behavior—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Educ 263, 381, 383; Psyc 245, 246, 248, 251, 291; PAd 223; Soc 203, 240, 241. All students must pass a Master's Comprehensive Examination.

SOCIOLOGY

Professors R.W. Stephens, I.H. Cisin, R.G. Brown, T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace, P.L. Stewart *(Chairman)*
Associate Professor J.L. Tropea
Assistant Professors T. Dietz, R.S. Frey

Bachelor of Arts with a major in sociology (departmental)—Three categories of majors are offered: (a) general major; (b) general major with a special concentration in crime, deviance, and justice; (c) general major with a special concentration in public policy. Options (b) and (c) require departmental approval. The following requirements must be met:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economics, geography, history, political science, or psychology.

4. Required courses in the major—Soc 101, 140–41, 149; general majors: 15 additional semester hours in second-group sociology courses; concentration in crime, deviance, and justice: Soc 135, 136, 137, 139, and one additional second-group sociology course; concentration in public policy: Soc 120, 122, 128, 181, and one additional second-group course in sociology.

Bachelor of Arts with a major in criminal justice (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—Anth 156, Phil 142, Psyc 130 and 154. PSc 115 is strongly recommended.
4. Required courses in the major—Soc 135, 136, 137, 139, 151 (9 credits), plus three additional second-group sociology courses.

Minor in sociology—A minimum of 15 hours of course work, including Soc 1, a basic course in either theory or methods, and nine hours of electives in courses at the 100 level or higher are required. Departmental advising is required.

Master of Arts in the field of sociology—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences. With the approval of the advisor and of the Graduate Education Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to six semester hours), satisfactory completion of a Master's Comprehensive Examination in sociological theory and social research methods and an oral defense of the thesis proposal; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in sociological theory, social research methods, and one substantive special field (deviant behavior; political sociology; sociology of work, occupations, and organizations; comparative social change; health policy; medical sociology; and social policy). Fifteen semester hours of elective courses must be interrelated in a logical way to form a subspecialization; 6 hours may be taken outside of the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. Students majoring in social policy need an additional statistics course; Stat 118 or 221 is suggested. All candidates must select from the graduate sociology courses as follows: six hours chosen from sociological theory (Soc 238 and 239 are recommended), six hours chosen from social research methods (Soc 230 and 231 are recommended), and six hours chosen from one special area (deviant behavior; political sociology; sociology of work, occupations, and organizations; comparative social change; health policy; medical sociology; and social policy). Candidates must also fulfill the tool requirement by passing a reading knowledge examination in one foreign language, by satisfactorily completing the quantitative tool option, or by satisfactorily completing the graduate course work option.

Doctor of Philosophy in the field of sociology—Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete from 30 to 36 semester hours of graduate course work, and from 12 to 18 semester hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study Soc 332 and 6 semester hours of graduate course work in each of the follow-

ing: sociological theory, social research methods, and two substantive specialties, at least one of which must be chosen from among those offered by the Department of Sociology—criminology; political sociology; sociology of work, occupations, and organizations; medical sociology; social gerontology; health policy; social policy; and comparative social change. Students must satisfactorily complete the General Examination in sociological theory, social research methods, and two substantive specialties. Students must also fulfill the tool requirement by taking any two of the following options: a reading knowledge examination in one foreign language, the quantitative tool option, or the graduate course work option.

Departmental prerequisite: Soc 1 is prerequisite to all sociology courses except Soc 181 and 191.

First Group

1 Introductory Sociology (3) **Staff**
General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior. (Fall and spring)

2 Major Social Issues (3) **Staff**
Critical examination of selected social issues in contemporary American society. (Fall and spring)

Second Group

101 **Development of Social Thought** (3) Lengermann, Stephens
An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories. (Fall)

120 **Sociology and Public Policy** (3) Dietz
Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy. (Fall)

122 **Selected Cases in Policy Analysis** (3) Dietz
Sociological analysis of topical issues in public policy (e.g., education, health, energy, welfare). (Spring)

124 **Medical Sociology** (3) Stewart, Brown
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services. (Fall)

125 **Sociology of Religion** (3) **Wallace, Yeide**
An analysis of the relationships between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years)

126 **Urban Sociology** (3) **Frey**
The sociological dynamics of the city and of urban growth in the United States; urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition, and revolt. (Fall)

127 **Population Problems** (3) Stewart, Dietz
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control. (Fall)

128 **Comparative Urban Sociology** (3) Frey
Processes of urbanization outside the United States; contrasts between socialist and non-socialist approaches to urban development; urban communities in the Third World and their problems. Prerequisite: Soc 126 or permission of the instructor. (Spring)

129 **Race and Minority Groups** (3) Stephens
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. (Spring)

130 **Class, Status, and Power** (3) Stephens, Brown
Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions. (Fall)

132 **The Family in Modern Society** (3) Stephens
An examination of the stages of family life: birth, childhood, premarital relationships, marriage and sex roles in marriage, retirement and old age. Special emphasis on development and maintenance of interpersonal relations. (Fall)

133 **Socialization and the Life Cycle** (3) Tropea, Wallace
Sociological approaches to the learning of cultural values and behavior from childhood through adolescence and adulthood. Emphasis on the relationship of socialization to selected groups, institutions, social control, and change. (Fall)

135 **Youth and Delinquency** (3) Courtless, Tropea
Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control. (Spring)

136 **Criminology** (3) Tropea, Courtless
Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. (Fall)

137 **Sociology of Law** (3) Courtless, Tropea
Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law. (Fall)

139 **Deviance and Control** (3) Tropea, Courtless
Analysis of the development of primary deviance through processes of socialization; analysis of the creation of secondary deviance through collective definitions and responses, within varying historical, political, and social contexts. (Spring)

140–41 **Social Research Methods** (3–3) Cisin, Dietz
Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140. (Academic year)

143 **Social Movements** (3) Stephens
General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)

149 **Modern Sociological Theory** (3) Wallace, Lengermann
Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101. (Spring)

151 **Problems of Urban Social Systems** (9) Staff
Developing a comprehensive perspective on selected social problems through lectures and readings. Topic changes each semester. Prerequisite: 24 semester hours selected from economics, history, political science, psychology, and sociology. Admission by permission of instructor. (Fall, spring, and summer)

152 Problems of Urban Social Systems—Supervised Field Work (6) **Staff**
Must be taken concurrently with Soc 151. A maximum of 24 hours a week will be spent in service-research efforts by placement in the Washington, D.C., area. (Fall, spring, and summer)

153 Poverty in America (3) **Staff**
Same as Econ 153.

155 Gender Roles and Socialization (3) Wallace, Lengermann
The roles of women and men from social structural and social psychological perspectives. Analysis of gender roles in the work force, gender control in social structures, and how gender roles influence personal identity. (Fall)

160 Death and Dying: A Sociological Perspective (3) Brown, Stewart
Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy. (Spring)

181 Major Social Processes (3) **Staff**
Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. A laboratory fee of $5 may be charged. (Fall and spring)

191 Current Emphases in Sociology (3) **Staff**
Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall and spring)

195 Research (1, 2, or 3) **Staff**
Independent study and special projects. Open only to selected undergraduate students with promising academic records. Before students are permitted to register for Soc 195, they must submit a written proposal of their plan of study for the approval of the staff member of the department who will be directing their research. (Fall and spring)

Third Group

203 Social Organization (3) Wallace, Brown
Introduction to sociological concepts and perspectives. An examination of empirical studies that utilize different theoretical perspectives. Recommended for students offering sociology as a supporting field. (Fall)

204 Overview of the Research Process (3) Cisin
Recommended for students who lack undergraduate preparation or recent study in the methodology of social research, and for students offering sociology as a supporting field. Not open to graduate students in sociology except as a deficiency course. (Spring)

210 Theoretical Foundations of Political Sociology (3) Lengermann
Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change.

220 Seminar: Sociology of Religion (3) Wallace, Yeide
Analysis of theoretical and empirical approaches to the study of religion as a social phenomenon. Both classical and contemporary contributions will be examined. Among the topics to be considered are secularization, new religious movements, and modes of religious organization. (Spring, even years)

225 **Theories of Social Change** (3) Lengermann
Review of sociological writings on modernity—its emergence in the North Atlantic societies, its consequences for third world societies, and its future. (Spring)

226 **Comparative Social Development** (3) Frey
Analysis of major issues in the sociology of development, urbanization, and modernization. Among the issues to be considered are political development, education, sex roles, urban growth, family welfare and change, and public administration. (Fall)

230 **Sociological Research Methods** (3) Cisin
Systematic survey of sociological research strategies and review of the literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Stat 105 or equivalent. (Fall)

231 **Seminar: Advanced Research Methods** (3) Cisin
Intensive study and evaluation of a few sophisticated research techniques and of new developments in the methodology of social research. Prerequisite: Soc 230, Stat 105, or equivalent. (Spring)

232 **Qualitative Methodology: Doing Field Research** (3) Stewart
Practical application of data collection methods in natural settings: observation, participant observation, and field experience. Emphasis on implementing research projects using these methods for purposes of developing empirically grounded theory.

235 **Seminar: Sociology of Education** (3) Wallace, Tropea
Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 **Seminar: Development of Sociological Theory** (3) Lengermann
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 **Seminar: Modern Sociological Theory** (3) Lengermann, Wallace
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 **Sociology of Work and Occupations** (3) Stewart
Review of major theoretical and empirical developments in industrial sociology; varying approaches to the study of work and occupations. (Fall)

241 **Sociology of Work and Organizations** (3) Stewart
Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision-making, recruitment, allocation of authority, informal organization, and interorganizational relations. (Spring)

242 **Seminar: Medical Sociology** (3) Stewart
Sociological analysis of cultural, social, and social-psychological factors in occurrence and care of physical and mental illness as they function in the community, the hospital, and in interpersonal relations; study of the social structure of health care services and interplay of the various health professions. (Spring)

252 **Seminar: Sociology and Social Policy** (3) Frey
Concepts, theory and research which demonstrate the applicability of a sociological perspective (for example, views on social systems, roles, formal organization, power, stratification, decision-making, social values) to the policy process. (Fall)

254 **Seminar: Methods in Social Policy Research** (3) Frey
Systematic survey of conceptualization, design, and practice of evaluation research of social experiments, and of simulation and technological forecasting. Prerequisite: Stat 105, Soc 230, 252; or permission of instructor. (Spring)

256 **Selected Topics in Social Policy Analysis** (3) Staff
A sociological perspective on selected policy areas, including urban planning, education, family, aging, health, affirmative action, law enforcement, and economic development. Particular policy areas will be rotated year by year. Course may be repeated for credit.

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Courtless, Tropea
Same as Law 475(2). (Fall)

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Courtless, Tropea
Same as Law 476(2). (Spring)

263 **Seminar: Law and Society** (3) Courtless
Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes. (Summer)

265 **Selected Topics in Criminal and Juvenile Justice Policy** (3) Courtless, Tropea
Development of a systematic perspective on policies affecting the juvenile and criminal justice systems. Topics will include adjudication, disposition, diversion, and sentencing. (Spring, even years)

280 **The Sociology of Aging** (3) Brown
Impact of current demographic changes (size and composition of the aged population) on the existing structure of American society. (Spring)

281 **Problems of Growing Old in American Society** (3) Brown
Analysis of the bases of the social status of the aged in American society, the impact on older people of characteristic situational changes in later life, and societal responses to those impact areas defined as social problems. (Fall)

290 **Principles of Demography** (3) Staff
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Staff
Same as Econ 291.

295 **Research** (arr.) Staff
Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

332 **Seminar: Processes of Inquiry** (3) Staff
Development and critical review of students' research projects with the objectives of aiding conceptualization and developing research design. Consideration of the interplay between theory and methods. Prerequisite: at least three semester hours each of graduate theory and graduate methods. May be repeated for credit.

* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to one additional semester hour. For description of the courses, see the *National Law Center Bulletin*.

351 **Selected Topics in Sociology** (3) **Staff**
Intensive investigation of special topics in sociological theory. May be repeated for credit. (Fall)

352 **Selected Topics in Sociology** (3) **Staff**
Intensive investigation of special topics in sociological research. May be repeated for credit. (Spring)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SPANISH

See **Romance Languages and Literatures.**

SPECIAL EDUCATION

Professors R.S. Cottrell, Jr., R.K. Ives *(Chairman)*, J.R. Shotel
Associate Professors M.S. Castleberry, L.A. Tsantis, N.J. Sobel, R.N. Ianacone
Assistant Professors M.B. Freund, A.J. Mazur, J.R. Snider *(Visiting)*, G.L. Harbin
Instructor D.M. Hiltenbrand

See the School of Education and Human Development for programs of study in special education leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, and Doctor of Education.

First Group

57 **Curriculum Development for the Special-Needs Child** (3) Mazur
An overview of theory and scope of pre-academic and academic curriculum development as it relates to the special child. (Fall)

58 **Curriculum Adaptation for the Special-Needs Child** (3) Mazur
Lectures, demonstration, and experiences designed to develop the student's ability to adapt curriculum and style of presentation to meet the needs of the special child. (Spring)

Second Group

101 **Dimensions of the Complementary Teaching Role: Implementation of the Resource Room** (3) **Mazur**
Instructional experiences designed to refine the insights and competencies essential for successful operation of the complementary teaching model. (Fall)

102 **Practicum: Teaching the Child with Special Needs: Methods and Materials** (3) Mazur
Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must be taken concurrently with SpEd 189. Material fee, $50. (Fall)

103 **Practicum: Teaching the Child with Special Needs: Creative Programming** (3) Mazur
Continuation of SpEd 102. Concentration on the total programming

of the child with special needs. Must be taken concurrently with SpEd 190. Material fee, $50. (Spring)

160 **Academic and Psychosocial Assessment of the Elementary-School-Aged Exceptional Child** (3) Mazur
An investigation of the assessment process: theory and scope of psycho-educational assessment, informal and formal assessment, clinical experience in informal assessment, application of diagnostic findings to instructional recommendations.

168 **Overview of Handicapping Conditions: Etiology and Symptomatology** (3) Staff
Causes and symptoms of most prevalent handicapping conditions in the mainstreamable child.

170 **Dynamics of Human Relations: Theory and Practice** (3) Mazur
Discussion of psychosocial theory as it relates to successful interaction with children. (Fall)

187–88 **Sign Language and Deafness** (3–3) Donnels and Staff
Same as Educ 187–88.

189 **Preprofessional Internship: Program Adaptation for the Special Needs Child in the Regular Classroom** (3) Mazur
Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Preprofessional Practicum: Inspecting a Continuum of Special Education Services** (3) Staff
Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with SpEd 103. (Spring)

197–98 **Special Study in Special Education** (3–3) Staff
Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

199 **Practicum in Complementary Teaching** (6) Mazur
Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Spring)

200 **Psychosocial Development of Young Exceptional Children** (3) Staff
The relationship between psychosocial development of the exceptional child and psychosocial development in general. Admission by permission of instructor. (Fall, alternate years)

Third Group

201 **Introduction to Special Education** (3) Staff
Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accomodate children in a school program. (Fall)

220 **Selected Topics in Special Education** (3 or 6) Staff
Courses on topics relevant to special educators offered to selected groups.

221 **Accessing Community Systems for the Handicapped Child** (3) Freund
Overview of health, social, and educational services in the community.

Provides an understanding of how best to integrate the handicapped child.

222 **Special Education in the Regular Secondary Classroom: Legislative Issues and Concerns** (3) Staff
Issues relating to interpreting and monitoring compliance with legislation addressing the needs of the handicapped in secondary schools. Emphasis on practical strategies in response to the mandates of current legislation.

229 **Vocational/Special Education Assessment for the Secondary-Level Handicapped Student I** (3) Ianacone
Individual study of methods and materials used in academic assessment, including formal and informal testing to determine achievement, learning styles, process disorders, diagnostic information, behavioral readiness, and functional life skill attainment. Material fee, $20. (Fall)

230 **Vocational/Special Education Assessment of the Secondary-Level Handicapped Student II** (3) Ianacone
Investigation of the vocational assessment process, including formal and informal systems to determine vocational interests, aptitudes, and employability skills. Material fee, $20. (Spring)

231 **Selected Vocational/Special Education Methods and Materials** (3) Hiltenbrand
Selected materials and techniques used in teaching and programming for the secondary school level handicapped person in academic, career, leisure, and occupational skill areas. (Fall)

232 **Practicum: Vocational/Special Education** (3) Ianacone, Hiltenbrand
Practical experience at employment and training sites which offer programs in the areas of pre-vocational and vocational training. (Fall)

233 **Curriculum for Vocational/Special Education** (3) Hiltenbrand
Examples and practice in designing, implementing, and modifying academic, career education, pre-vocational, and vocational curricula for the handicapped. (Fall)

234 **Seminar in Vocational/Special Education** (3) Staff
A weekly seminar which addresses the experiences, problems, and concerns encountered during the internship. Must be taken concurrently with SpEd 295. (Spring)

235 **Coordination of Job Placement Programs in Vocational/Special Education** (3) Staff
Programming options, rationale, and resources used to better serve persons with handicaps in the job placement process. (Spring)

236 **Secondary Career Planning for the Handicapped** (3) Staff
Introduction and analysis of current procedures and processes used in the career development and vocational preparation of persons with handicaps. (Summer)

240 **Developmental Process of Parenting: Parenting the Handicapped Child** (3) Freund and Staff
The developmental process of becoming a parent and ongoing parenting. Particular attention is paid to parenting the handicapped child. Material fee, $20. (Spring)

253 **Special Education for Adjudicated Youth: State of the Art** (3) Staff
Seminar offering an overview of special education for adjudicated youth through presentation by theorists and practicing professionals. (Fall)

254 **Special Education for Adjudicated Youth: Field Experiences** (3) — Staff
Site visitations to local, state, and federal facilities coordinated by a series of seminars tying theory to practice. (Summer)

255 **Academic and Vocational Assessment in Special Education for Adjudicated Youth** (3) — Staff
Development of assessment skills with current academic and vocational diagnostic instruments for use with adjudicated youth. (Summer)

256 **Practicum in Special Education for Adjudicated Youth** (6) — Staff
The application of special education methods and materials; developing individualized programs for adjudicated youth. (Fall)

257 **Internship in Special Education for Adjudicated Youth** (9) — Staff
Full-time field experience with special education adjudicated youth; bimonthly University seminars. Opportunity to synthesize and integrate total program objectives. (Spring)

260 **Developmental Assessment in Special Education** (3) — Harbin, Sobel, Tsantis
Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor. Material fee, $25. (Fall and summer)

261 **Practicum: Methods and Materials for Young Exceptional Children** (6) — Tsantis, Castleberry, Harbin, Shotel
Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires eight hours a week in service. (Fall)

262 **Seminar: the Education of Young Exceptional Children** (3) — Castleberry, Harbin
Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young exceptional children. Must be taken concurrently with SpEd 292. Admission by permission of instructor. (Spring)

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3) — Staff
Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience. (Fall)

264 **The Severely and Profoundly Handicapped Child: Methods and Techniques** (3) — Staff
Specialized programs, techniques, and methods for teaching children with severe disabilities. (Spring, even years)

265 **Clinical Experience with Multiply Handicapped and Developmentally Disabled Young Children** (3) — Ives, Castleberry
Preliminary field experience designed for students with limited experience in early childhood special education. Supervised experience necessary for program articulation. Three-week intensive involvement in an early childhood special education setting. (Summer)

266 **The Development of Language in Young Exceptional Children** (3) — Harbin
Introduction to the study of language acquisition and the application of current research on language of handicapped children. (Fall and summer)

267 **The Early Childhood Special Educator: A Survey of Roles, Services, and Issues** (3) Castleberry
Examination of the spectrum of roles available in early childhood special education; emphasis on the historical, legal, and philosophical aspects of early childhood special education. (Summer)

268 **The Development of Young Exceptional Children with Emphasis on Handicapping Conditions** (3) Freund
An in-depth examination of the development of young exceptional children and the specific nature of handicapping conditions. Lecture and field visitations. (Fall)

269 **Multidisciplinary Theory in Special Education** (3) Castleberry
Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships. Material fee, $25. (Fall)

270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum to Meet the Needs of the Special Child** (3) Staff
Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, alternate years)

271 **The Interdisciplinary Approach to Planning for the Exceptional Child: Theory and Practice** (3 or 6) Freund
Theory of, and field experience in, interdisciplinary team functioning. (Spring)

273 **Seminar for Special Education Strategist Intern** (3) Shotel, Tsantis
Weekly seminar dealing with experiences, problems, and concerns encountered during special education early childhood strategist internship. Concurrent enrollment in SpEd 293 required. (Spring)

288 **Psychoeducational Characteristics of the Seriously Emotionally Disturbed Adolescent** (3) Sobel
An in-depth examination of relevant diagnostic categories, psychosocial development issues, and the nature and needs of the seriously disturbed adolescent. (Fall)

289 **Curriculum Methods for the Seriously Emotionally Disturbed Adolescent** (3 to 6) Sobel
Design and implementation of appropriate educational and management plans, under the supervision of the instructor in a field-based practicum experience. (Fall)

290 **Control and Management Techniques in the Special Education Classroom** (3) Castleberry
Examination of the theory, techniques, and tools essential for effective classroom management. Admission by permission of instructor. (Spring)

291 **Education of the Seriously Emotionally Disturbed Adolescent: An Integrative Seminar** (3) Sobel
Exploration of relationship between theory and practice, unifying total course work as it relates to professional interdisciplinary aspects. (Spring)

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9) Castleberry, Harbin
Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. Must be taken concurrently with SpEd 262. (Spring and summer)

293 **Professional Internship for the Special Education/Early Childhood Strategist** (6 to 9) Shotel, Tsantis
Supervised internship in strategist role, emphasizing diversified,

multi-dimensional aspects of a special education/early childhood program. A minimum of 420 clock hours is required. Concurrent enrollment in SpEd 273 required. (Spring)

294 **Professional Internship: Service to the Seriously Emotionally Disturbed Adolescent** (6 to 9) Sobel
Full-time placement as a psycho-educator in a residential or extended day-care site. (Spring)

295 **Professional Internship in Vocational/Special Education** (6 to 9) Ianacone, Hiltenbrand
Supervised internship in the vocational/special education of adolescent handicapped youth, emphasizing the diversified, multi-dimensional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with SpEd 234. (Spring)

296 **Philosophical, Legal, and Practical Issues in the Implementation of Public Law 94-142** (3) Shotel
Historical and legal perspectives that have led to Public Law 94–142, The Education for All Handicapped Children Act of 1975, and the consequences of this act on public school service delivery systems. Emphasis on the present and future impact of this law and its interpretation on the regular class teacher and administrator and on their roles within a public school system. (Summer)

297–98 **Individual Study in Special Education** (3–3) Staff
Individual study or research under guidance of staff member. Program and conferences arranged with advisor. Admission by permission of advisor. May be repeated for credit. (Academic year)

303 **Administration and Supervision of Special Education** (3) Ives, Castleberry
Philosophy and nature of special education; program organization, administration, and development. Surveying local needs; program evaluation and supervision. Admission by permission of instructor. (Summer)

304 **Recent Research and Trends in Special Education** (3) Harbin
Emphasis on research methodology and considerations. The unique problems of doing research in special education. Procedures and sources for obtaining research funding. Admission by permission of instructor. (Spring)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) Castleberry, Tsantis, Ives
Theoretical foundations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children. (Spring)

308 **Instructional Processes in Special Education: The Trainer of Trainers** (3) Ives
Review of the instructional processes as they affect education and special education, including the university and staff development perspective; opportunities for practice in needs assessment, program design and actual instruction. Admission by permission of instructor. (Fall)

343 **Psychoeducational Diagnosis of Children with Behavior or Learning Difficulties** (3) Tsantis and Staff
The range of diagnostic strategies applicable to the child who presents psycho-social and related learning difficulties. Admission by permission of the instructor. (Spring)

345 **Consultation Skills in Special Education** (3) Shotel
Consultation models from organizational development, organizational

psychology, and mental health applied to in-service training for educational personnel and facilitating appropriate programs for the special child in the public schools. (Spring)

350 **Child Identification and Assessment: The Process of Planning Appropriate Educational Intervention** (3) Staff
Exposes administrators/supervisors to information relative to the exceptional child. Examines etiologies and symptomologies of handicapping conditions, developmental norms, identification and assessment strategies, and individualized educational programming.

351 **Seminar: Developing Home/School/Community Support Systems—Models for Effective Service Delivery** (3) Sobel
Provides experiences that facilitate effective service planning for the handicapped child through the examination of existing models of family intervention, curriculum adjustment, and special education service delivery. (Spring)

352 **Seminar: Legal Issues and Public Policy Concerns in Planning Service Access for the Special Child** (3) Staff
Reviews the responsibilities of their existing roles with regard to requirements generated by the legislative and judicial branches of the government. (Summer)

360 **Interdisciplinary Techniques in the Diagnostic Process in Special Education** (3) Tsantis and Staff
Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent, and permission of instructor. (Fall)

370 **Attitude Change and the Access Process for the Special Child: Individual Ability to Change** (3) Ives
Applies specific psycho/social constructs germane to successful human interaction to the professional milieu of the special education consultant/administrator. (Fall)

Fourth Group

401 **Doctoral Mini-Seminar in Special Education** (3) Staff
Participation in a small group with a selected faculty member; intensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Spring)

453–54 **Doctoral Internship: Special Education** (6–6) Staff
Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship individually arranged. Admission by permission of advisor. (Academic year)

480 **Evaluation in Special Education** (3) Shotel
Application of educational evaluation models to special education situations. Special consideration given to the work of Haines, Popham, Scriven, Stake, Stufflebeam, Taba, and Tyler. Practical application of the theoretical models will be stressed. (Fall)

490 **Departmental Seminar in Special Education** (3) Shotel
Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Fall)

491 **Dissertation Research** (arr.) Staff

SPEECH AND DRAMA

Professors J.W. Hillis *(Director of Speech-Language Pathology and Audiology)*, L.S. Bowling *(Chairman)*, W.M. Reynolds *(Director of Speech Communication)*, L.S. Bielski, G.R. Herer, C.H. Sterling

Associate Professors M.D.M. Brewer, J.R. Regnell, C.W. Linebaugh, J.E. Thiel

Assistant Professors N.C. Garner, S. Keller *(Director of Forensics)*, B.W. Sabelli, A.G. Wade, L.B. Jacobson *(Acting Director of Drama)*, W.A. Pucilowsky, B.R. Williams, C.E. Scala, S.L. Murray

Assistant Professorial Lecturers L.B. Beck, J.D. Schafer

Bachelor of Arts with a major in dramatic art (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Required courses in related areas—24 semester hours of second-group courses outside the Department of Speech and Drama as approved by the major advisor (including 12 semester hours in dramatic literature).
3. Required courses in the major—SpDr 1, 11, 114, 151, 152, 165–66, 195; 18 additional semester hours in second-group drama courses.

*Bachelor of Arts with a major in radio-television (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Required courses in related areas—18 semester hours in a single subject area outside the Speech and Drama Department as approved by the major advisor.
3. Required courses in the major—SpDr 1, 11, 49 or 110, 75, 133, 134, 137 or 138, and 145. Twelve hours of second-group courses (three hours must be in a theory course) chosen from the areas of radio-television and film studies, and/or from speech communication, drama, and speech pathology audiology as approved by the major advisor.

Bachelor of Arts with a major in speech communication (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas– 12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Speech and Drama as approved by the major advisor.
4. Required courses in the major—SpDr 112, 121, 126; 15 additional semester hours of second-group courses in the Speech and Drama Department as approved by the major advisor.

Minor in speech communication—18 semester hours of speech and drama courses, including SpDr 1, 11, 112, 121, and 126.

* Admission to this major may be on a selective or space-available basis.

Bachelor of Arts with a non-professional major in speech-language pathology and audiology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses—SpDr 1, 11.

3. Required courses in related areas—Psyc 115, 121 and 131 (or their equivalent), plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.

4. Required courses in the major—SpDr 101, 103, 104, 108, 118, 119; six additional semester hours of courses in the Department of Speech and Drama as approved by the major advisor.

Master of Arts in the field of speech-language pathology and audiology—Prerequisite: the degree of Bachelor of Arts with a major in speech-language pathology and audiology from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work without a thesis, or with the approval of the department, 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech-Language-Hearing Association.

All students must take the National Examination in Audiology or in Speech Pathology available through the Educational Testing Service. Students must request the Testing Service to send copies of the test scores to the department of speech and drama to be used in the fulfillment of the general requirement in the Graduate School of Arts and Sciences for the Master's Comprehensive Examination. Satisfactory test results must reach the department at least three weeks before graduation.

Master of Fine Arts in the field of dramatic art—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of (1) 30 semester hours of second- and third-group course work planned in consultation with the advisor; (2) a creative thesis (equivalent to six additional semester hours) in the selected area of concentration. Each candidate is expected to complete the program in residence in four continuous semesters.

Bachelor of Arts in Education and Human Development with a teaching field in speech and drama—Prerequisite: the education curriculum; required: the speech and drama option and the professional courses stated under the School of Education and Human Development.

Speech and Hearing Therapy: See the Speech and Hearing Center.

First Group

1 Communicative Speaking and Listening (3) Reynolds and Staff
Basic theories and principles of public speaking: research, composition, delivery, and criticism. Recording fee, $5. (Fall and spring)

2 Interpersonal Communication (3) Reynolds
Introduction to the role of verbal and nonverbal transactions in spontaneous, face-to-face encounters. Role-playing, models, and simulations. (Summer)

11 Voice and Diction (3) Bielski and Wade
Development of naturalness, correctness, and clarity in conversa-

tion through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, $5. (Fall and spring)

45 **Understanding the Theater** (3) Sabelli
The art of the theater: its literature, architecture, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for non-majors. (Fall and spring)

49 **Rhetoric in Political and Social Action** (3) Keller
Study of the use and abuse of rhetoric in contemporary political and social movements. Theories of persuasion and agitation, as well as means of support considered in various case studies including civil rights, anti-war protests, and women's rights. (Fall)

55 **Introduction to Electronic Mass Media** (3) Williams
An introduction to the various forms of radio and television, emphasizing current roles in American society. The nature, scope, and influence of these media are covered, along with a historical perspective and review of research methods used for their study. Intended to provide general background and context to the student without prior knowledge of the field; for non-majors. (Fall and spring)

75 **Sight and Sound** (3) Thiel
Development of a critical awareness of auditory and visual communication through an introduction to the techniques and aesthetics of electronic media. Lecture (2½ hours), laboratory (2 hours). Prerequisite: permission of instructor for non-majors. Laboratory fee, $10. (Fall and spring)

Second Group

101 **Bioacoustics** (3) **Brewer**
Acoustic analysis of speech and the physiology of reception and processing of speech by the human auditory system. Prerequisite: BiSc 3-4 or 11-12 or equivalent; Psyc 1 or 5 or 6 or equivalent. (Fall)

102 **Neural Substrates of Speech, Hearing, and Language** (3) Linebaugh
An introduction to the basic neurophysiology, feedback systems, motor systems, neuroanatomical and neurophysiological substrates and correlates of speech, hearing, and language will be covered. (Spring)

103 **Biophonetics** (3) **Linebaugh**
Biological bases of speech-language production. Emphasis on the function of the nervous system, the respiratory system, and the vocal and articulatory mechanisms in the production of intelligible speech. Prerequisite: BiSc 3–4 or 11–12 or equivalent; Psyc 1, 5, or 6, or equivalent. (Fall)

104 **Introduction to Speech-Language Pathology** (3) Regnell
Survey of the field of speech-language pathology. The effect of body-system pathologies and environmental factors on the production of speech and language. Prerequisite: SpDr 103 or permission of instructor. (Spring)

105–6 **The Writing of Plays** (3–3) Claeyssens
Same as Engl 105–6.

108 **Introduction to Audiology** (3) **Brewer**
Survey of the field of audiology. The effect of body-system pathologies on the reception of speech and other acoustic stimuli. Proce-

dures of pure-tone and speech audiometry. Clinical and educational services for the hearing impaired. Prerequisite: SpDr 101. (Spring)

109 **Shakespeare in Performance** (3) Wade
The study of Shakespeare's plays in and through performance. Students view selected productions of the BBC-TV Shakespeare series, attend a Folger Theatre Group production, and perform scenes from the plays. Prerequisite: permission of instructor. (Summer)

110 **Interpretation** (3) Wade
The study of literature through performance. Interpretation of prose, poetry, and drama. (Fall and spring)

111 **Business and Professional Speaking** (3) Reynolds
Study of the communication process in business and professional organizations; practice in interviewing, small group communication, and speeches for special occasions. Primarily for nonmajors. (Fall)

112 **Persuasion** (3) Keller
In-depth study of the principles and techniques of persuasion focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: SpDr 1 or permission of instructor. (Spring)

113 **Voice for the Theater** (3) Jacobson
The practice and application of voice production in four areas: skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual awareness of the process of voice production and its application to dramatic texts. Prerequisite: SpDr 11 and permission of instructor. (Fall)

114 **Introduction to Acting** (3) Jacobson
Basic techniques of concentration, imagination, improvisation, and character analysis. (Fall and spring)

115 **Scene Study: Classical Realism** (3) Garner
Principles of role development, concentrating on early 20th-century material by playwrights such as Chekhov, Ibsen, and Shaw. Concurrent registration in HKLS 115 required. Prerequisite: SpDr 114 and permission of instructor. (Fall, even years)

116 **Scene Study: Modern Comedy** (3) Garner
Principles of role development, comic timing, and stage business, concentrating on material by contemporary playwrights such as Slade and Simon. Concurrent registration in HKLS 116 required. Admission by audition. Prerequisite: SpDr 114. (Spring, odd years)

117 **Audition Techniques** (1) Jacobson
The course examines all aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: SpDr 114 or the equivalent. (Spring)

118 **Structural Analysis of Speech and Language** (3) Staff
Development of skills in the phonetic/phonemic transcription and syntactic analysis of oral language samples. Prerequisite: Psyc 115 or equivalent. (Spring)

119 **Clinical Procedures for Communication Disorders** (3) Hillis
Development of skill in precision treatment techniques for communication disorders. Emphasis on accountability of providers of clinical and educational services for the communicatively handicapped. Prerequisite: Psyc 121 and 131, or equivalent, and permission of instructor. (Fall)

120 **Advanced Study of Clinical Procedures for Communicative Disorders** (1 to 3) Hillis
Seminar on problems encountered in clinical practice for remedia-

tion of communicative disorders. Staffings of active case material from clinical and educational settings. Development of hardware and software programming skills for treatment of communicative disorders. Term project required for graduate students. Concurrent clinical or educational placement required. Prerequisite: SpDr 119 or equivalent. (Spring)

121 **Group Discussion and Conference Leadership** (3) Reynolds
Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1 or permission of instructor. (Fall and spring)

122 **Scene Study: Verse Drama** (3) Garner
Principles of role development and handling of verse dialogue, concentrating on material by Shakespeare, as well as modern verse playwrights such as Maxwell Anderson, T. S. Eliot, and Christopher Fry. Prerequisite: SpDr 114 and permission of instructor. (Fall, odd years)

123 **Scene Study: Classical Comedy** (3) Garner
Principles of role development, concentrating on material from the English Restoration, Moliere, and other 17th- and 18th-century playwrights. Prerequisite: SpDr 114 and permission of instructor. (Spring, even years)

126 **Argumentation and Debate** (3) Reynolds
Study of the advocacy system; special emphasis on issue identification, use of evidence, and logical proof. Extensive practice in argumentative speaking. Prerequisite: SpDr 1 or permission of instructor. (Spring)

127–28 **Forensic Practice** (1–1) Keller and Wade
Student participation in intercollegiate speech activities. May be repeated for a total of four semester hours of credit. Admission by permission of instructor. (Fall and spring)

129 **TV News: The Politics of Visibility** (3) Lichter
Same as PSc 129.

132 **Radio-Television Performance** (3) Staff
Introduction to the basic theories and techniques required for effective, non-dramatic media performance (i.e., announcing, moderating, newscasting, etc.). Prerequisite: SpDr 1, 11, or 110. (Spring)

133 **Development of American Electronic Media** (3) Thiel
Study of the origins, structure, and nature of American broadcasting and related media. (Fall)

134 **Radio Production** (3) Williams
Introduction to the basic concepts of radio as a communication medium; emphasis on the design and production technique of a variety of radio programs. Lecture (2½ hours), laboratory (2 hours). Prerequisite: SpDr 75 (for radio-television majors) or permission of instructor. Laboratory fee, $10. (Fall and spring)

135–36 **Radio Workshop** (1–1) Williams
Theory and practice in radio station operations. Admission by permission of instructor, after one semester of satisfactory participation in WRGW activities. May be repeated for a total of four semester hours of credit. (Academic year)

137 **Scriptwriting** (3) Staff
Study and practice of the forms, techniques, and types of writing for radio, television, and film. Prerequisite: Engl 11 or 12, and SpDr 75 (for radio-television majors) or permission of instructor. (Spring, odd years)

138 **Scriptwriting: Selected Topics** (3) Wade
Intensive study and practice of a specific genre of radio, television, and film writing. Topics may include adapting the literary text, series and serials, and anthology drama. Prerequisite: Engl 11 or 12, and SpDr 75 (for radio-television majors) or permission of instructor. (Spring, even years)

141 **Negotiations and Conflict Resolution** (3) Keller
Communications factors involved in negotiation and conflict resolution. Use of models and simulations to explore prominent-solution approach to conflict situations. (Summer)

142 **Topics in Electronic Media** (3) Staff
An in-depth study of specific topics and/or controversial issues. (Summer)

143 **Origins of Contemporary Rhetorical Theory** (3) Reynolds
Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)

144 **History and Criticism of American Public Address** (3) Reynolds
Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Spring, odd years)

145 **Introduction to Television Production** (3) Staff
Basic course in television production techniques and skills. Directing, scriptwriting, graphics, and other aspects of television production. Extensive practice in working television equipment; emphasis on various in-studio projects. Lecture (2 hours), laboratory (2½ hours). Prerequisite: SpDr 134. Laboratory fee, $10. (Fall)

146 **Television Directing** (3) Thiel
Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Lecture (2 hours), laboratory (3 hours). Prerequisite: SpDr 145 and permission of instructor. Laboratory fee, $10. (Spring)

147 **Innovations in Electronic Media** (3) Williams
Examination of current and future trends in electronic communications, with emphasis on both broadcast and non-broadcast radio and television, including technology, programming, industry structure, and public policy. Prerequisite: SpDr 133. (Fall)

148 **Television Production** (3) Williams
Close examination of the role of the producer in the television industry. Emphasis on the creative and executive aspects of producing. Prerequisite: SpDr 145. (Fall)

149 **Communicative Effects of Electronic Media** (3) Williams
Theories and research pertaining to issues, controversies, and problems relating to electronic media effects on the American public. Prerequisite: SpDr 133 or permission of instructor. (Spring)

151 **Stagecraft** (3) Staff
Lecture (2 hours), laboratory (1 hour). Theories and practicum in construction, rigging, and scene painting. (Fall and spring)

152 **Fundamentals of Stage Lighting** (3) Staff
Lecture (2 hours), laboratory (1 hour). Theories and practicum in the execution of lighting for the theater. (Fall and spring)

154 **Directing** (3) Wade
Fundamentals of script analysis, casting and rehearsal techniques.

Prerequisite: a course in acting or interpretation and a course in theater history or dramatic literature. Laboratory fee, $10. (Fall)

156 **Make-Up Design** (3) Staff
Theory and practicum in the art of make-up design, including prosthesis, mask making, latex. (Fall)

157 **Stage Management** (1) Sabelli
Fundamental study of stage management with emphasis on practical production work, as well as theory. (Fall and spring)

158 **Theater Architecture** (1) Sabelli
Study of general principles, theories, and styles of theater architecture. (Spring, even years)

163 **Musical Theater** (3–6) Sabelli and Jacobson
Growth of American musical theater. Development of all its components: libretto, dance, composition, lyrics, and the overall fabric of production. (Summer)

165–66 **History of the Theater** (3–3) Pucilowsky
An examination of the development and growth of the theater from its beginnings to the present. SpDr 165: Greek through Restoration. SpDr 166: the 18th century to the present. (Academic year 1979-80 and alternate years)

171 **Language of Cinema** (3) Staff
Introduction to cinema as language through analysis of the components of film structure—camera, editing, sound, movement, music, dialogue and mise-en-scéne. Admission by permission of instructor for non-majors. (Fall)

172 **Film Directors and Styles** (3) Staff
Examination of influence on major film directors of twentieth-century art movements: German expressionism, Soviet constructivism, surrealism, neo-realism and structuralism. Comparison of film narrative with styles in dramatic and visual art forms. Prerequisite: SpDr 173 or 192. (Fall)

173 **History of Cinema** (3) Staff
An examination of motion picture history in terms of socially structured narrative from Griffith to Godard. Same as Art 173. (Fall)

174 **Special Studies in Film** (3) Staff
An intensive study of film structure as exemplified by the work of a single director or film genre. Prerequisite: SpDr 173 or 192. (Spring)

175 **The Political Image** (3) Staff
An analysis of the techniques of propaganda and rhetoric used in film and television to visualize political ideology. (Spring, even years)

176 **Film as Fact and Fiction** (3) Staff
A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. (Spring, odd years)

180 **Regulation and Policy in Electronic Communication** (3) Sterling
Legal, technical, political, economic, and social aspects of radio, television, and cable and related delivery systems. Structure and operation of FCC and other agencies, plus role of Congress and courts. Consideration of problems in spectrum allocation, behavioral regulation, the trend to deregulate political influence, and current policy matters. Prerequisite: SpDr 55 or 133. (Fall)

191 **Anthropology, Drama, and the Human Experience** (3) Turnbull, Garner
A comparative approach to the meaning of humanity in different

cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Offered jointly with the Anthropology Department.

192 **The American Cinema** (3) Staff
History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. Same as AmCv/Art 192. (Spring)

193 **Scene Design** (3) Sabelli
Fundamental study of scenography, including drafting, rendering, stage properties, and model construction. (Fall)

195 **Costume History and Construction** (3) Pucilowsky
History of fashion in Western civilization from ancient Egypt to the present. Fundamental study of costume design, including drawing and rendering techniques through specific projects. Laboratory work in costume construction. (Fall and spring)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects. Open only to undergraduate students in their senior year. Before students are permitted to register for SpDr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

Third Group

SpDr 268–290 and 295 are for Master of Arts candidates in the field of speech-language pathology and audiology; other students may be admitted by permission of the department.

205 **Costume Design** (3) Pucilowsky
Introduction to the basic techniques of costume design through specific projects. Various rendering techniques will be explored consistent with the different historical periods. Prerequisite: SpDr 195. (Spring, odd years)

213 **Special Problems in Speech for the Actor** (3) Jacobson
An advanced study of vocal production and interpretation for the actor. The work will focus on stage dialects, and the articulation and interpretation of Shakespeare's plays. Prerequisite: SpDr 113. (Spring)

215–16 **Acting: Scene Study** (3–3) Jacobson
Scene work in modern, classic, and other nonrealistic drama. Admission by audition. Both courses may be repeated once for credit. Recording fee, $4. (Academic year)

250 **Advanced Scene Design** (3) Sabelli
Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting, traditional script analysis, and original scenographic interpretations. (Fall)

251 **Special Projects in Scene Design** (3) Sabelli
Exploration of all styles of traditional and contemporary scenography. Admission by permission of instructor. (Spring)

252 **Advanced Costuming** (3) Pucilowsky
Study of special design, style, and construction problems. (Spring)

253 **Problems in Costume Design** (3) Pucilowsky
The study of pattern drafting and draping methods based on historical costumes through lecture and classwork. Basic millinery construction and design. Prerequisite: SpDr 195. (Spring, even years)

255 **Lighting Design** (3) **Sabelli**
Theory and execution of lighting design for theater and television. Prerequisite: SpDr 152. (Spring)

256 **Directing Seminar** (3) **Garner**
Problems in directing plays from selected periods. May be repeated for credit. (Spring)

257 **Modern Trends** (3) **Staff**
Study of recent developments in dramatic theory, literature, and production. (Fall, even years)

258 **Theater Management** (3) **Staff**
Theory and practice in theater management: promotion, box office, and house management. Admission by permission of instructor. (Fall, odd years)

261–62 **Theatrical Styles** (3–3) Pucilowsky
Detailed study of the culture, climate, and production techniques of significant periods of drama. Prerequisite: SpDr 165–66. (Academic year)

267 **Study of Industrial Communication Disorders** (3) Bowling
Study of theories and processes pertinent to communication disorders related to industrial noise. (Fall)

268 **Clinical Practice in Communication Disorders** (1–3) **Staff**
Supervised clinical practice in the evaluation and treatment of communication disorders. May be repeated for a total of three semester hours of credit. (Fall and spring)

269 **Community Programs in Communication Disorders** (3) **Herer**
Methods and procedure for the planning, management, and operation of hospital, school, and other community programs for the communicatively handicapped. (Fall)

270 **Audiological Evaluation of Children** (3) Bowling
A study of the development of the sense of hearing: underlying causes of auditory deficits and audiometric techniques used to measure hearing in children. (Summer)

271 **Developmental Disorders of Speech Production** (2) Regnell
Evaluation of persons with speech articulation disorders; test demonstrations, oral peripheral examination; special segments on evaluation and treatment of velopharyngeal dysfunction (including cleft palate) and cerebral palsy. Laboratory fee, $7.50 (Fall)

272 **Disorders of Speech Articulation** (3) Hillis
Consideration of speech articulation disorders from physiologic, acoustic, perceptual, linguistic, and learning points of view. Review of treatment methods and programs. Laboratory fee, $7.50 (Spring)

273 **Language Disabilities in Children: Identification and Diagnosis** (2) Staff
Review of current theoretical approaches to evaluation; a diagnostic model to facilitate evaluation and interpretation; review of available standardized tests; observation and testing experience. Laboratory fee, $7.50. (Fall)

274 **Language Disabilities in Children: Remediation** (3) Staff
Review of current therapeutic models; use of diagnostic information for designing a remedial plan; monitoring progress; coordinating language remediation with classroom and additional resource sup-

port; experience through monitoring ongoing language remediation. Laboratory fee, $7.50. (Summer)

275 **Speech Fluency Disorders: Evaluation and Treatment** (3) Hillis
Procedures for clinical assessment of stuttering and other disorders of speech rate and rhythm. Review of historical and current methods for treatment. Laboratory fee, $7.50. (Fall)

276 **Speech Fluency Disorders: Theory and Research** (3) Hillis
Consideration of stuttering and other disorders of speech rate and rhythm from developmental, linguistic, physiological, and psychosocial points of view. Laboratory fee, $7.50. (Summer)

277 **Differential Diagnosis of Acquired Language Disorders** (2) Linebaugh
Review of neurological substrates of language processing and widely used tests of acquired language disorders; consideration of patterns of communicative deficits related to various neuropathologies, with emphasis on their differentiating clinical features and prognosis. Laboratory fee, $7.50. (Fall)

278 **Rehabilitation of Acquired Language Disorders** (3) Linebaugh
Review of the nature of acquired language disorders and factors affecting patient performance; consideration of specific treatment approaches and methods for assessing recovery and efficacy of treatment. Laboratory fee, $7.50. (Spring)

279 **Motor Speech Disorders: Differential Diagnosis and Treatment** (3) Linebaugh
Methods of assessing motor speech disorders and their physical and acoustic characteristics; approaches to the treatment of the dysarthrias and apraxia of speech. Laboratory fee, $7.50. (Summer)

280 **Functional Voice Disorders** (3) Regnell
Review of the normal structure and function of the vocal mechanism, acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with functional voice disorders. Programs for the remediation of these voice problems will be covered. Laboratory fee, $7.50. (Fall)

281 **Organic Voice Disorders** (3) Regnell
Acquisition of knowledge and clinical/educational skills in providing speech evaluation and treatment for persons with organic voice disorders; special inclusion of management of laryngectomized persons. Laboratory fee, $7.50. (Spring)

283 **Aural Rehabilitation** (3) Brewer
Systems, principles, and methods of auditory training and speech reading, including development of lesson plans and their application in resolving communication problems of acoustically handicapped individuals. Laboratory fee, $7.50. (Spring)

284 **Advanced Clinical Audiology** (3) Brewer
Psychoacoustic principles and methods underlying assessment of auditory disorders. Clinical implications, tests; demonstration and practicum. Laboratory fee, $7.50. (Fall)

285 **Hearing Aids** (3) Staff
Discussion of hearing-aid characteristics and electroacoustic measurements; hearing-aid effectiveness in improving communicative efficiency; procedures for selection and clinical evaluation of hearing aids; counseling of the patient. Laboratory fee, $7.50. (Spring)

286 **Special Auditory Tests** (3) Bowling
Special audiometric techniques for cochlear and retro-cochlear lesions, identifying functional hearing losses; study of electrophysio-

logical techniques. Clinical application of tests and interpretation of results. Laboratory fee, $7.50. (Fall)

287 **Auditory Processing** (3) **Bowling**
Detailed study of the factors which affect auditory perception and comprehension; methods and procedures used in identifying disorders of auditory perception and comprehension. Laboratory fee, $7.50. (Spring)

288 **Psychosocial Aspects of Hearing Loss** (3) **Bowling**
Consideration of the rationale and procedures for evaluating the social and emotional behavior as well as the intellectual potential of those with impaired hearing. Laboratory fee, $7.50. (Spring)

289 **Impedance Audiometry and Middle Ear Function** (3) Staff
Development of skills in impedance audiometry and audiological assessment of middle ear function. Laboratory fee, $7.50. (Fall)

290 **Management of the Hearing-Impaired Child** (3) Brewer
Overall management approach to the hard-of-hearing child including diagnosis, parent counseling, amplification, educational placement, treatment programs and procedures, and re-evaluation. Prerequisite: a course in basic principles and procedures in audiology. Laboratory fee, $7.50. (Summer)

292 **Seminar: Communicative Disorders in School Children** (arr.) Staff
Variable topics concerned with provision of remedial services for hearing, language, and speech handicapped school children. May be repeated for credit. Admission by permission of instructor. Laboratory fee, $7.50. (Summer)

294 **Independent Research in Dramatic Art** (arr.) **Staff**
May be repeated for credit. (Fall and spring)

295 **Independent Research in Speech-Language and Hearing** (arr.) **Staff**

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

STATISTICS

Professors H.F. Bright, S. Kullback *(Emeritus)*, H.W. Lilliefors, A.D. Kirsch *(Chairman)*, J.L. Gastwirth, D. Krueger *(Research)*, S.W. Greenhouse, N.D. Singpurwalla, M. Halperin *(Research)*, R.T. Smythe, L.J. Wei, J.M. Lachin III *(Research)*
Professorial Lecturers B. Bailar, J. Kullback, K.M. Wolter, C.T. Ireland, F. Ponti
Associate Professor R.E. Thomas
Associate Professorial Lecturers P.P. Biemer, N.J. Kirkendall, R. Jacob, R. Abbott, T.C. Teeples, S. Shrier
Assistant Professor P. Thall
Assistant Professorial Lecturers P. Wirtz, J.S. Wu

Bachelor of Arts or Bachelor of Science with a major in statistics (departmental), statistics with an option in computer science (departmental), or computer and information systems (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for all majors—Math 31, 32, 33; Stat 91 (except computer and information systems majors).

3. Required courses for all majors—Math 124; Stat 107, 108.

4. (a) Required courses for the statistics major—Stat 118, 119, 157–58, 189, plus three approved second-group courses in statistics.

(b) Required courses for the statistics major with an option in computer science—Math 113; Stat 114, 118, 119, 157–58, plus three approved second-group computer related courses.

(c) Required courses for the computer and information systems major—Math 113; Stat 114, 133, 134, 135, 142, 157–58 or 189–90, plus three approved courses from Stat 145, 146, 147, 148, 149, 150.

5. Students planning on doing graduate work in statistics are advised to take Stat 190, Math 139 and 140, and two years of a foreign language. Math 157 is also recommended.

6. To assure a balanced program, departmental approval of electives is required for all majors.

Students who seek Special Honors in statistics should check with the Department.

Minor in statistics—

1. General minor (with calculus): Stat 91, 118, 119, 157, 158, and 107 or 197.

2. Applied minor (without calculus): Stat 53 and 105, or 111 and 112, 118, 187 or 188, 107 or 197, and 183.

3. Computer science minor (with calculus): Stat 107, 108, 114, 133, 135, plus one approved second-group course from those applicable to the computer and information systems major.

Master of Science in the field of applied statistics or *Master of Arts in the field of mathematical statistics*—The program of study consists of 30 to 36 semester hours of course work without a thesis. In exceptional cases the department may approve a program of study consisting of 24 to 30 semester hours of course work plus a thesis, equivalent to six additional semester hours. Candidates must pass a written Master's Comprehensive Examination and must fulfill the tool requirement by passing either a reading knowledge examination in an acceptable foreign language or an examination in computer language. For prerequisites and additional requirements, see below.

Master of Science in the field of applied statistics—Three options are provided: (a) a general curriculum in applied statistics; (b) a concentration in biostatistics; (c) a concentration in sampling and survey research. Prerequisite: Math 31, 32, 33, and 124; Stat 118 and 157–58. (Stat 157–58 is not required if Stat 201–2 is included in the program.)

Required: the general requirements stated under the Graduate School of Arts and Sciences and 33 to 36 semester hours of course work. If the student has not previously had Stat 119 (Analysis of Variance) or equivalent, the program must include Stat 221 or 217–18. Courses are selected in consultation with the advisor.

(a) *General curriculum in applied statistics*—The core curriculum includes Stat 201–2 and Stat 210. An additional 24 semester hours must be chosen in consultation with the advisor.

(b) *Concentration in biostatistics*—The core curriculum includes Stat 187, 201–2, 210, 225–26, 227, 231. Twelve additional semester hours are electives of which 6 hours must be in statistics and 6 hours must be in health sciences or related areas. All electives must be approved by the advisor.

(c) *Concentration in sampling and survey research*—The core curriculum includes Stat 187, 193, 196, 210, 287–88. An additional 15 semester hours are electives of which at least 9 credit hours must be in statistics (Stat 201–2 is strongly recommended). All electives must be approved by the advisor.

Master of Arts in the field of mathematical statistics—Prerequisite: a bachelor's degree with a major in statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study. Additional prerequisites include Math 139 and 140. Under certain circumstances some prerequisites may be waived; check with the Department.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Stat 201–2 and 217–18. The remaining 18 semester hours must be selected in consultation with the advisor.

Doctor of Philosophy in the field of mathematical statistics—Prerequisite: the degree of Master of Arts in the field of mathematical statistics from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. A minimum of 24 semester hours of course work must be taken in residence at this University before the General Examination may be completed. The General Examination consists of two written parts, each followed by an oral examination. Part I covers mathematics and probability and may be taken after successful completion of Stat 259–60 or 273–74. Part II may be taken after the successful completion of the remaining core courses (Stat 201–2, 217–18, 257–58, 263–64, 265–66, 287) and electives selected in consultation with the advisor. The tool requirement may be fulfilled by passing a reading knowledge examination in one foreign language and an examination in computer language.

Research Fields: Biostatistics, design of experiments, information theory, multivariate analysis, nonparametric statistics, probability, robust methods, sampling, statistical inference, stochastic processes, and time series analysis.

Departmental prerequisite: One entrance unit in algebra is prerequisite to all first-group courses in statistics. Stat 114 is prerequisite to courses that follow it under Computer and Information Systems, below.

STATISTICS*

First Group

†51 **Introduction to Business and Economic Statistics** (3) Wei and Staff
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, probability distributors, sampling, estimation, tests of hypotheses, regression and correlation, index numbers. (Fall and sprng)

†53 **Introduction to Statistics in Social Science** (3) Staff
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

†91 **Principles of Statistical Methods** (3) Lilliefors
Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

Second Group

103 **Sampling in Accounting** (3) Bright
Special emphasis on applications of sampling techniques to business decisions and to auditing; simple and stratified samples; cluster samples; opinion polling. Prerequisite: Stat 51, 53, 91, or equivalent. (Fall and spring)

* For computer and information systems and other computer courses, see listings that follow.
† Stat 51, 53, 91, 104, 111, and 127 are related in their subject matter, and credit hours for only one of the six may be applied toward a degree.

*104 **Statistics in Management, Administration, and Policy Studies** (3) Staff
Lecture (3 hours), laboratory (1 hour). Introductory study of statistical techniques for research problems. For graduate students in fields other than statistics who have no previous statistics training.

105 **Statistics in the Behavioral Sciences** (3) Kirsch
Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53, 104, or equivalent, and satisfactory performance on a placement examination. (Fall and spring)

*111 **Business and Economic Statistics I** (3) Staff
Statistical methods appropriate for applications in economics and business. (Fall)

112 **Business and Economics Statistics II** (3) Staff
Continuation of Stat 111 with emphasis on techniques of regression, Chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring)

118 **Regression Analysis** (3) Staff
Lecture (3 hours), laboratory (1 hour). Regression and correlation theory; simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127. Laboratory fee, $20. (Fall and spring)

119 **Analysis of Variance** (3) Staff
(Formerly Stat 117)
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $20. (Spring)

123 **Introduction to Econometrics** (3) Staff
Same as Econ 123.

*127 **Statistics for the Biological Sciences** (3) Staff
Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design. (Fall and spring)

131 **Contingency Table Techniques** (3) Staff
Analysis of multidimensional contingency tables, including estimation, tests of hypotheses, and log-linear regression. Prerequisite: Stat 118 or permission of instructor. Laboratory fee, $25. (Spring)

153–54 **Mathematical Models in Population Genetics** (3–3) Staff
Basic elements of genetics and cell reproduction, deterministic models of gene frequency; the Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple allele models; inbreeding; Fisher's fundamental theorem of natural selection; stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods.

155 **Introduction to Probability** (3) Staff
Probability distribution, Bayes' theorem and postulate, mathematical expectation, laws of large numbers. Prerequisite: one entrance unit in algebra.

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* Stat 51, 53, 91, 104, 111, and 127 are related in their subject matter, and credit hours for only one of the six may be applied toward a degree.

157–58 **Introduction to Mathematical Statistics** (3–3) Staff
Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: differential and integral calculus. (Academic year)

159 **Principles of Bayesian Statistics** (3) Staff
Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semester hours in introductory statistics, or equivalent.

160 **Mathematical Statistics for Economics Students** (3) Staff
Preparation for Stat 275. Prerequisite: differential and integral calculus. (Spring)

181 **Applied Time Series Analysis** (3) Staff
Auto- and cross-correlation, spectral analysis, coherence, transfer relations, linear filters, seasonal adjustment, mean square regression, autoregressive moving average models, forecasting, Box-Jenkins methods, spectral analysis of variance, and signal detection and discrimination methods. Prerequisite: a first course in statistics, calculus. Laboratory fee, $20. (Fall)

187 **Introduction to Sampling** (3) Staff
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3) Lilliefors
Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 **Mathematical Probability and Applications** (3–3) Staff
Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

193 **Questionnaire Design** Staff
Principles and procedures for developing effective questionnaires for mail, telephone, and personal interview surveys. Prerequisite: Stat 187 or equivalent, or permission of instructor. (Spring)

195 **Reading and Research in Statistics** (arr.) Staff
May be repeated once for credit. (Fall and spring)

196 **Seminar: Major Governmental Surveys** (3) Staff
Analysis of problems in conducting and using governmental surveys. Topics include sample design, question wording, field collection procedures, and basic tabulations. Surveys covered include the 1980 census, the Consumer Price Index series, and a representative survey in the areas of education and health.

Third Group

201–2 **Mathematical Statistics** (3–3) Lilliefors
Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. (Academic year)

205 **Data Analysis for Policy Decisions** (3) Staff
The framing of questions of importance in policy and the use of existing data bases to answer these questions. Laboratory fee, $20. Prerequisite: Stat 105 or equivalent.

206 **Multivariate Methods in the Behavioral Sciences** (3) Kirsch
Application of multivariate analysis to data of the social sciences. Techniques covered will include factor analysis, cluster analysis, discriminant analysis, and other topics. Prerequisite: Stat 105 or 118,

and prior permission of the instructor. Not open to graduate students in statistics. Laboratory fee, $20.

210 **Data Analysis** (3) Lachin
The application of statistical methods of data analysis using statistical packages on a computer as applied to the data sets from several settings. Methods to be chosen from analysis of contingency tables, the general linear model, regression, discrimination and classification, nonparametric methods. Prerequisite: Stat 118 and 197, or tool proficiency in computer programming, or Stat 183. Laboratory fee, $20.

215–16 **Applied Multivariate Analysis** (3–3) Staff
Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 117, 157–58, and Math 124. Laboratory fee, $18. (Academic year)

217–18 **Advanced ANOVA and Experimental Design** (3–3) Thall
Advanced theory and application of general linear hypothesis to experimental designs. Prerequisite: Stat 157–58 or 201–2; Math 124. (Academic year)

221 **Design of Experiments for Behavioral Sciences** (3) Kirsch
Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 118 or equivalent and permission of instructor. Not open to graduate students in mathematical statistics. (Spring)

223 **Bayesian Inference** (3) Singpurwalla
Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201–2.

225–26 **Biostatistics** (3–3) Greenhouse
Probability models, inference, and study design as applied to biomedical investigations. Prerequisite: Stat 201–2. (Alternate academic years)

227 **Research Strategies: Biostatistical Basis and Analysis** (3) Lachin
The statistical basis for the design, implementation, and analysis of each of the basic methods of scientific research: the cross-sectional study, the cohort follow-up study, the case-control (retrospective) study, the randomized comparative study (including clinical trials), and other non-randomized observational and epidemiologic studies. Prerequisite: Stat 105 or 118 or permission of instructor.

231 **Contingency Table Analysis** (3) Staff
A study of the theoretical bases underlying the analysis of categorial data. Prerequisite: Stat 201–2 or 257–58.

242 **Advanced Statistical Problems in Economic Analysis** (3) Gastwirth
Applications of advanced theory to economic data.

257–58 **Distribution Theory** (3–3) Gastwirth
Properties of distribution and characteristic functions, probability bounds, large- and small-sample theory, order statistics. Prerequisite: Stat 157–58 or 201–2. (Alternate academic years)

259–60 **Advanced Mathematical Probability** (3–3) Smythe
Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: advanced calculus and permission of instructor. (Alternate academic years)

261 **Sequential Design and Analysis** (3) Staff
Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201–2. (Spring, odd years)

262 Nonparametric Inference (3) Wei
Inference when the form of the underlying distribution is unspecified.

263–64 Topics in Statistical Inference (3–3) Lilliefors
Estimation, testing of statistical hypotheses, tests of significance, likelihood ratio, Bayesian inference and the use of prior knowledge, decision theory. Prerequisite: Stat 201–2 or 257–58. (Alternate academic years)

265–66 Multivariate Analysis (3–3) Greenhouse
Tests of significance, homogeneity, independence, canonical and vector correlations, multivariate normal distribution, generalized Student's ratio, multivariate linear hypothesis, and analysis of variance. Prerequisite: Stat 201–2 or 257–58; Math 124. (Alternate academic years)

273–74 Stochastic Processes (3–3) Smythe
Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Prerequisite: Stat 189–90; and 201–2 or 257–58. (Alternate academic years)

275 Econometrics I: Introduction (3) Staff
Joint offering of the Departments of Statistics and Economics. Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equations problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Recommended: a course in matrix theory. (Fall)

276 Econometrics II: Simultaneous Equations Models (3) Staff
Joint offering of the Departments of Statistics and Economics. Economic models and simultaneous equations systems. Prerequisite: Stat 275. (Spring)

279 Methods in Economic Statistics (3) Gastwirth
Joint offering of the Economics and Statistics Departments. Application of statistical methods to economic data. Curve-fitting, regression, analysis of variance, and chi-square and non-parametric techniques are used to analyze economic data. Prerequisite: a one-year course in statistics. (Fall and spring)

281 Time Series Analysis I: Foundations (3) Staff
Basic structure of stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, the Finite Fourier Transform, laws of large numbers, autoregressive moving average processes. Prerequisite: Stat 201–2 and 259–60 or 273–74. (Spring)

282 Time Series Analysis II: Statistical Inference (3) Staff
Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance. Prerequisite: Stat 281.

283 Advanced Statistical Laboratory (3) Staff
Application of the University computer to complex statistical problems on an individual study basis. Admission by permission of instructor. Laboratory fee, $25. May be repeated for credit only with permission of the Department. (Fall and spring)

285–86 Seminar: Special Topics in Sample Survey (3–3) Staff
Admission by permission of instructor.

287–88 Modern Theory of Sample Surveys (3–3) Staff
Application of statistical theory to the sampling of finite populations. Simple, stratified, cluster, double and subsampling. Special topics,

including super-populations and randomized response. Prerequisites: Stat 91 and Math 32 or equivalent. (Academic year)

289 **Seminar** (3) Staff
Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Staff
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Staff
Same as Econ 291.

295 **Reading and Research** (3) Staff
May be repeated once for credit. (Fall or spring)

297 **Problems in Mathematical Statistics** (3) Staff

298 **Seminar: Special Topics** (3) Staff

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

378 **Seminar: Topics in Econometrics** (3) Staff
Same as Econ 378.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

COMPUTER AND INFORMATION SYSTEMS

Second Group

*107 **Introduction to Computing** (3) Staff
(Formerly Stat 97)
Computer and programming concepts; algorithm development. High-level language programs written by students will be run on the University computer. Laboratory fee, $25. (Fall and spring)

108 **Computer Programming** (3) Thomas
(Formerly Stat 106)
Development of advanced computing ideas using a high-level language. Emphasis on careful design and implementation of programs using "structured programming." Prerequisite: Stat 107 or equivalent. Laboratory fee, $25. (Fall and spring)

114 **Data Structures** (3) Staff
Files and file systems. Linked lists and trees. Basic structure of processing operations, creation, updating, sorting, merging, searching, linkage, hashing. Introduction to data processing, storage, and retrieval. This course is prerequisite to the following courses in Computer and Information Systems.

133 **Computer Organization and Assembly Language** (3) Staff
Data representation and arithmetic; computer structure and machine language; computer architecture. Assembly language; addressing techniques; file input and output. Study of an actual small computer. Prerequisite: Stat 114. Laboratory fee, $25. (Fall)

134 **Operating Systems** (3) Staff
Techniques for handling simultaneous processes; dynamic procedure activation; synchronization and mutual exclusion; semaphores. Op-

* Credit will not be given for both Stat 107 and 197.

erating system design methodologies; abstract data types; monitors; kernels. Memory management; memory hierarchy; paging. Recovery procedures. Prerequisite: Stat 133. Laboratory fee, $25. (Spring)

135 **Survey of Programming Languages** (3) Staff
(Formerly Stat 121)
Structured and non-structured languages; list-structured languages; pattern matching and symbol manipulation languages; interpretive and interactive languages; variable binding. Prerequisite: Stat 114. Laboratory fee, $25. (Spring)

142 **Introduction to Automata Theory** (3) Staff
Finite state automata. Turing machines and computability; universal Turing machine; computable and noncomputable functions; halting problem; computational complexity. Formal grammars and their relationship to automata. Prerequisite: Stat 114; a course in propositional calculus. Laboratory fee, $25.

145 **Compiler Design** (3) Staff
Grammars, languages, syntax, and semantics. Lexical analysis; symbol tables; context-free language parsing techniques; code generation. Prerequisite: Stat 142. Laboratory fee, $25.

146 **Design and Development of Software** (3) Staff
(Formerly Stat 166)
Design techniques; structured programming; code reading; stepwise refinement; top-down design; information hiding; coupling and cohesion. Development of a multi-component software project by students. Prerequisite: Stat 114. Laboratory fee, $25. (Fall)

147 **Artificial Intelligence** (3) Staff
(Formerly Stat 167)
Representation of knowledge; notational systems such as logics, programming languages, trees, and networks; LISP. Search strategies; heuristics; production rule systems. Algorithms used in AI; natural language processing, vision, manipulator operation, theorem proving, problem solving. Prerequisite: Stat 114. Laboratory fee, $25.

148 **Data Base Systems** (3) Staff
(Formerly Stat 178)
Sequential file processing; random access storage. Hierarchical, network, and relational data models. Data normalization; data description languages; query facilities. File and index organization; inverted files. Data integrity and reliability; computer security. Prerequisite: Stat 114. Laboratory fee, $25.

149 **Simulation and Modeling** (3) Staff
(Formerly Stat 179)
Discrete simulation of real-world systems. Simulation techniques and languages; queues; event-driven simulation systems. Analysis of algorithms; predicting system performance; queuing theory. Prerequisite: Stat 114; some statistics. Laboratory fee, $25.

150 **Current Topics** (3)
(Formerly Stat 198)
Concepts of programming, programming languages, operating systems, nonnumeric programming compiler techniques. Prerequisite: Stat 114 or permission of instructor. Laboratory fee, $25. May be repeated for credit. (Spring)

OTHER COMPUTER COURSES

Second Group

183 **Intermediate Statistical Laboratory: Statistical Computing Packages** (3) Staff
Application of program packages (e.g., Biomed, SPSS, SAS) to the solution of multivariate statistical problems. Basic concepts in data file, preparation/manipulation, analytical technique, and interpretation of results. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127. Laboratory fee, $25.

*197 **Digital Computer Programming with Applications** (3) Thomas
Lecture (2 hours), laboratory (2 hours). Use of digital computer in statistical and other computational work. Writing, debugging, and running programs on the digital computer in the University Computer Center. Prerequisite: Stat 118; or Math 32; or permission of instructor. Laboratory fee, $25. (Fall and spring)

TELECOMMUNICATIONS POLICY—GRADUATE PROGRAM

Academic Director D.A. Rowley

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in telecommunications policy. The program focuses on policy issues in the telecommunication industry.

Master of Arts in the field of public policy with a concentration in telecommunications policy—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required core courses are Econ 217, 247; PSc 203; and Psyc 244. Required courses for the field of study are Econ 249; EE 250 *(Telecommunication Systems Concepts)*, 251 *(Survey of Telecommunication Systems)*; PSc 222, 224; TCom 240; and two courses selected in consultation with the advisor. Each student must pass a Master's Comprehensive Examination.

240 **Seminar in Telecommunication Policy and Regulation** (3)
International and domestic telecommunications institutions, the policy and regulatory process; spectrum management; cable telecommunications systems; common carrier/microwave transmission systems; mobile system; broadcasting AM, FM, UHF, VHF-TV; satellites; U.S. domestic satellites; mobile satellite system; international telecommunications law; environmental impact; U.S. government systems; INTELSAT.

UNIVERSITY COURSES

University Professors M. Cunliffe, A. Etzioni, P.J. Caws

University courses are offered by distinguished scholars and scientists who hold appointments as University Professors. With the approval of the department or program, appropriate University courses may be taken to satisfy degree program requirements. Permission of the University Professor is required. Specific courses are listed in the *Schedule of Classes* in the 700 series.

* Credit will not be given for both Stat 107 and 197.

URBAN AND REGIONAL PLANNING

Professors D.C. McGrath, Jr. *(Chairman)*, S.S. Fuller
Adjunct Professor F. Gutheim
Associate Professors S. Greene, D.E. Gale
Associate Professorial Lecturers A. Kreimer, R.F. Kirby
Assistant Professor M.J. Enders
Assistant Professorial Lecturer J.L. Preston
Visiting Lecturer O.T. Carr, Jr.

See the School of Government and Business Administration for the program of study leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration, Doctor of Business Administration, and Doctor of Public Administration.

Second Group

153 **Introduction to Urban Planning and Design** (3) Greene
Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Fall)

154 **Survey of American Urban and Regional Planning** (3) Enders
Examination of the historical roots, recent trends, issues, and new directions of American planning concepts, as well as the social and political forces which shape the character of planning in the United States. The roles of institutions, politicians, planners, and the general public in the planning process. Particular emphasis is placed on urban planning at the local governmental level. Prerequisite: junior standing. Not open to graduate students of the Department of Urban and Regional Planning. (Spring and summer)

177 **Introduction to Historic Preservation** (3) Gale
Washington, D.C., will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other locations will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. Same as AmCv 177. (Spring and summer)

Third Group

201 **Introduction to Urban and Regional Planning** (3) Gale, Enders
Introduction to history, concepts, and activities of urban and regional planning. Discussion of trends in urbanism and the influences of technology and social change. To be taken concurrently with U&RP 202. (Fall)

202 **Urban Planning Theory** (3) Gale, Enders
Development of the fundamental theories and concepts of urban growth and change, theories of the planning process, the role of politics in the planning process, and roles of the planner. To be taken concurrently with U&RP 201. (Fall)

203 **Principles of Community Planning and Design** (4) Greene
(Formerly Fundamentals of Urban Design)
Planning and design studio to develop and apply planning methods and graphic techniques, principles of land use and community design; analysis of factors affecting community development and change.

Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Spring)

207 **Land Development Planning** (3) McGrath
Selected problems in urban and regional planning: applications of zoning, urban growth management, renewal, and special programs available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Fall)

208 **Land Use and Urban Transportation Planning** (3) Enders, Kirby
Relationships between land use and the movement of goods and people. Examination of land use and transportation planning principles, issues, and techniques. Roles of public and private interests in land use and transportation planning and management. Prerequisite: U&RP 154 or permission of instructor.

210 **Urban Development Economics** (3) Fuller
Economic forces affecting urban growth and change; relationships among cities, metropolitan areas, and regions in the context of the national economy; socioeconomic implications of urban land development policies; basic studies and methods of economic analysis. Prerequisite: Econ 217–18 or equivalent or permission of instructor. (Spring)

212 **Methods of Urban and Regional Analysis** (3) Fuller, Preston
Introduction to methods used to analyze, estimate, and forecast population, employment, income and economic growth and development. Includes time series, index numbers, survey sampling and questionnaire design, shift-share, and case study methods. Prerequisite: Stat 51 or equivalent. (Fall)

215 **Advanced Planning Problems** (4) McGrath, Enders
Investigation of complex problems of the metropolitan region, analysis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and individual planning projects. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203. (Fall)

218 **Metropolitan and Regional Planning** (3) Fuller
Multidisciplinary study of the methods of regional analysis and process of regional planning; development of projects of regional scale requiring problem analysis, synthesis, and plan formulation. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203 and 212 or permission of instructor. (Spring)

232 **Environmental Planning** (3) Enders
Examination of the role of the planner in environmental planning and management activities. Theories, data, analytical techniques, plan-making approaches, and implementation tools employed in environmental planning. Discussion of environmental planning in both urban and rural areas; related energy conservation issues. Prerequisite: U&RP 154 or permission of instructor. (Spring)

241 **Federal and State Urban Policy Development** (3) McGrath
(Formerly U&RP 240)
Investigation of contemporary trends in the evolution of federal and state governmental functions and programs affecting urban growth and development policy. Planning functions in the evolving relationships among units of federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or permission of instructor. (Spring)

242 **International Urban Planning** (3) Enders
Examination and comparison of the theories of and approaches to

urban planning in various countries. Analysis of the types of planning and development techniques employed and their effectiveness. Applicability of such approaches and methods within the context of the American urban planning process. Prerequisite: U&RP 201 or permission of instructor. (Fall)

251 **Housing and Community Development: Concepts and Methods** (3) Fuller

An examination of the basic theories, concepts, principles, and analytical methods for managing the planning process by which cities approach the resolution of their development and housing needs. Housing supply and demand conditions, market analysis, physical inventory methods, community facility planning and impact analysis, commercial revitalization, and neighborhood theory and dynamics. Prerequisite: U&RP 201 or permission of instructor. (Fall)

252 **Housing and Community Development: Case Studies and Applications** (3) Gale

The application of theory and methodology to contemporary housing and community development issues. Examination of federal policies and programs, community facilities, redevelopment and adaptive reuse projects, and the role of the private sector. Case studies and field trips. Prerequisite: U&RP 251 or permission of instructor. (Spring)

255 **Urban Housing** (3) Fuller

A seminar that explores the principal issues affecting the demand for and supply of housing, including home financing, housing costs, tenure options, rehabilitation and conservation, market dynamics and requirements, and public sector involvement. Prerequisite: U&RP 251 or permission of instructor. (Summer)

256 **Neighborhood Dynamics** (3) Gale

Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer)

257 **Fiscal Policy and Urban Planning** (3) Gale

Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital projects financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall)

258 **Advanced Urban Development Economics** (3) Carr

Analysis of case studies of large-scale development projects to gain comprehension of financial, political, legal, and technical complexities and constraints inherent in the urban development process. Prerequisite: U&RP 210 or permission of instructor. (Fall)

261 **Community Planning and Design: Concepts and Methods** (3) Greene

Investigation of perceptual, social, physical, and aesthetic factors in planning and design. Emphasis on interaction of users and the environment, principles and process of community design, visual analysis, evaluation and implementation techniques. Prerequisite: U&RP 203 or permission of instructor. (Fall)

262 **Community Planning and Design: Case Studies and Applications** (3) Greene

Planning and design studio; application of community design principles and process to typical problems of community change and development. Laboratory fee, $20. Prerequisite: U&RP 261 or permission of instructor. (Spring)

263 **Community Preservation and Design Studio** (3) Greene
Interdisciplinary studio class: application of the techniques and methods of historic preservation, urban planning, housing and community development, community design, and other disciplines to problems of revitalizing urban areas. Surveys, inventories, analyses, formulation of proposals, and presentation to faculty and cooperating groups. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Summer)

274 **International Historic Preservation** (3) Gutheim
Comparative examination and analysis of international organizations and activities dedicated to the preservation of historical places and cultural traditions. Review of national and multi-national policies affecting preservation interests. (Spring)

276 **U.S. Architectural History** (3) Staff
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

277–78 **Historic Preservation** (3–3) Gutheim
Joint offering of the Urban and Regional Planning Department and the American Studies Program. The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural and humanistic values affecting preservation activities. Same as Hist 277–78. (Academic year)

290 **Special Topics in Urban and Regional Planning** (3) Staff
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3) Staff
Directed research and investigation of special problems in community development. May be repeated once for credit. (Fall and spring)

298 **Directed Readings and Research in Urban and Regional Planning** (3) Staff

299 **Thesis Seminar** (3) Fuller, Gale
Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

WOMEN'S STUDIES—GRADUATE PROGRAM

Assistant Professor P.M. Palmer *(Coordinator for Academic Affairs)*
Assistant Professorial Lecturers B. Pillors, N. Polikoff

Committee on Women's Studies
V.R. Allan, M.M. Cassidy, C.W. Conable, S.E. Haber, P.M. Palmer, B. Pillors, N. Polikoff, S.J. Tolchin, R.A. Wallace

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in women's studies, directed by the Committee on Women's Studies and drawing upon faculty from various departments within the University and resource persons in the community.

Women's studies seeks to examine and integrate the contributions of established academic disciplines to an understanding of the historical and contemporary role and status of women, and to provide training necessary to evaluate and formulate equitable public policy for women. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective candidates should consult with the director of the Women's Studies Program.

Master of Arts in the field of public policy with a concentration in women's studies—Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work, with or without a thesis. All students must take four of the six core courses in the public policy core (Stat 111 and 183, Econ 217, PSc 203, Psyc 244, CSci 100), with Stat 111, CSci 100 *(Introduction to Computer Science)*, and Econ 217 recommended; WStu 240 may be substituted for the core policy analysis course (PSc 203). The required core courses in women's studies are WStu 220 and 225, and a final six hours of either WStu 283 and 295 or WStu 299–300. Of the remaining four courses, two must be in the same discipline, which may be in the humanities, social sciences, or public administration. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

220 **Perspectives on Women** (3) Palmer
Research and theory from the social sciences and humanities as they influence the concept of public policies on women at work, in families, and in education. (Fall)

221 **Research Issues in Women's Studies** (3) Staff
Socialization and the educational system, work and the economy, sexuality and the family, health and life cycle issues. Problem identification in these and other areas; introduction to current research. Prerequisite: WStu 220. (Fall)

225 **Feminist Theory** (3) Polikoff
Theoretical foundations of feminism in the U.S. Theories and proposals for change currently espoused. Although focus is primarily on feminism of contemporary white America, some third world and European thought will be considered. (Fall)

240 **Women and Public Policy** (3) Pillors
Systematic analysis of public policy formation at the federal, state, and local levels as it relates to the status of women. Strategies for change and impact of the women's movement. Team and individual research projects on executive decision-making, legislation and its implementation, and political party structures. (Spring)

241 **Women and the Law** (3) Staff
Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Fall and spring)

251 **Women, Literature, and the Arts** (3) Staff
Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Spring)

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and historical changes in that role. Societal view of women's work in the home and outside it; interrelationships of women in and out of the work force; women's contributions, traditionally and during national crises; class, race, and ethnic differences. (Spring)

270 **Seminar: Selected Topics** (3) Staff
Investigation of a current policy issue of particular concern to women, or consideration of women's status in a particular social system. (Fall and spring)

280 **Independent Study** (3) Staff
May be repeated for credit. Arrangements must be made with sponsoring faculty member prior to registration.

283 **Practicum in Women's Studies** (3) Palmer
Study of the changing status of women through supervised assignment to public and private agencies engaged in education, counseling, political action, and research. Placement arrangements should begin the semester prior to registration for this course.

284 **Practicum** (arr.) Palmer

295 **Independent Research in Women's Studies** (arr.) Staff
Individual library or field research. Program advisor's approval of a written proposal required.

299–300 **Thesis Research** (3–3) Staff

The courses listed below, which emphasize the experience of women in the past and present, are available in Columbian College for undergraduate and graduate students:

AmCv/Hist 185	*Women in America* (3)	DePauw
Clas 170	*Women in Classical Antiquity* (3)	Norton
Econ 141	*Women in the Labor Market* (3)	Haber
Hist 125	*Women in European History* (3)	Schwoerer
Hist 285	*Women in the United States* (3)	DePauw
Psyc 150	*Psychology of Sex Differences* (3)	Poppen
Rel 181	*Women in Western Religion* (3)	Quitslund
Soc 155	*Gender Roles and Socialization* (3)	Wallace

YIDDISH

See Classics.

ZOOLOGY

See Biological Sciences.

FACULTY AND STAFF OF INSTRUCTION

Columbian College of Arts and Sciences
Graduate School of Arts and Sciences
School of Education and Human Development
School of Government and Business Administration
School of Public and International Affairs

EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Ruth Harriet Atwell, *Professor Emeritus of Physical Education for Women*
Ph.B. 1918, Denison University; M.A. in Ed. 1933, George Washington University

Richard Adrian Barrett, *Professor Emeritus of Business Administration*
B.A. 1930, Amherst College; M.B.A. 1932, Harvard University; D.B.A. 1972, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Perry Botwin, *Professor Emeritus of Special Education*
B.S. 1942, Rutgers—The State University; M.A. 1947, New York University; Ed.D. 1957, Columbia University

Marcella Brenner, *Professor Emeritus of Education*
B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 1962, George Washington University

Arthur Edward Burns, *Professor Emeritus of Economics*
B.A. 1931, M.A. 1934, University of California, Berkeley; Ph.D. 1938, George Washington University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University, England

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

Mary Ellen Coleman, *Professor Emeritus of Education*
B.S. 1937, Madison College; M.A. in Ed. 1950, George Washington University

George Frederick Conner, *Associate Professor Emeritus of Business Administration*
B.S. 1929, U.S. Military Academy; M.B.A. 1938, Harvard University

Milton Crane, *Professor Emeritus of English*
B.A. 1937, M.A. 1938, Columbia University; M.A. 1941, Ph.D. 1942, Harvard University

Milton Charles Devolites, *Professor Emeritus of Health Services Administration*
B.A. 1938, Harvard University; M.A. 1953, Baylor University

James Carlton Dockeray, *Professor Emeritus of Finance*
B.A. 1929, Ohio Wesleyan University; M.A. 1931, Ph.D. 1936, Ohio State University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

Frederick Harrell Gibbs, *Professor Emeritus of Health Care Administration*
B.S. 1956, University of Maryland; M.H.A. 1959, University of Minnesota

Ira Bowers Hansen, *Professor Emeritus of Zoology*
B.S. 1926, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Henry William Herzog, *Vice President and Treasurer Emeritus*
B.S. in C.E. 1930, LL.D. 1978, George Washington University

Thomas Willard Holland, *Professor Emeritus of Labor Economics*
B.A. 1923, University of Michigan; LL.B. 1934, Columbia University; Ph.D. 1939, University of Wisconsin

Thelma Hunt, *Professor Emeritus of Psychology*
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

Joe Lee Jessup, *Professor Emeritus of Business Administration*
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 1964, University of Chungang, Korea

Eva Mayne Johnson, *Professor Emeritus of Psychology*
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University

Everett Herschel Johnson, *Professor Emeritus of Statistics*
B.A. 1926, DePauw University; M.A. 1929, Lehigh University; Ph.D. 1942, University of Michigan

Elmer Louis Kayser, *Professor Emeritus of European History; Dean Emeritus of the Division of University Students; University Historian*
B.A. 1917, M.A. 1918, LL.D. 1948, George Washington University; Ph.D. 1932, Columbia University; L.H.D. 1975, Mount Vernon College

Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology*
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University

George Martin Koehl, *Professor Emeritus of Physics*
B.A. 1931, University of North Carolina; M.A. 1933, George Washington University

Solomon Kullback, *Professor Emeritus of Statistics*
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 1934, George Washington University

John Francis Latimer, *Professor Emeritus of Classics*
B.A. 1922, Litt. D. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Yale University

Helen Bennett Lawrence, *Professor Emeritus of Physical Education for Women*
B.S. in P.E. 1934, M.A. 1938, George Washington University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Laurence Pereira Leite, *Professor Emeritus of Art*
M.A. 1958, Ph.D. 1966, Johns Hopkins University

Ralph Kepler Lewis, *Professor Emeritus of Anthropology*
B.A. 1934, Southwest Missouri State College; M.A. 1939, University of Southern California; Ph.D. 1957, Columbia University

Kurt London, *Professor Emeritus of International Affairs*
Ph.D. 1923, University of Würzburg

William Allan MacDonald, *Professor Emeritus of Art and Archaeology*
B.A. 1940, Oberlin College; M.A. 1942, Ph.D. 1943, Johns Hopkins University

Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration*
B.B.A. 1950, M.B.A. 1951, University of Texas; Ph.D. 1959, Ohio State University

Anthony Marinaccio, *Professor Emeritus of Education*
Ed.B. 1937, Central Connecticut State College; M.A. 1939, Ohio State University; Ph.D. 1949, Yale University; LL.D. 1961, Parsons College

Muriel Hope McClanahan, *Associate Professor Emeritus of English*
B.A. 1935, Colorado College; M.A. 1937, Ph.D. 1940, University of Pittsburgh

Margaret McIntyre, *Professor Emeritus of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1944, Northwestern University; A.P.C. 1963, George Washington University

Florence Marie Mears, *Professor Emeritus of Mathematics*
B.A. 1917, Goucher College; M.A. 1924, Ph.D. 1927, Cornell University

Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History*
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University

Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History*
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg

Robert Hamilton Moore, *Professor Emeritus of English*
B.A. 1934, M.A. 1936, Indiana University; Ph.D. 1948, University of Illinois

Edith Elizabeth Mortensen, *Professor Emeritus of Zoology*
B.A. 1925, Carleton College; M.A. 1927, University of Minnesota; Ph.D. 1945, George Washington University

Charles Rudolph Naeser, *Professor Emeritus of Chemistry*
B.S. 1931, University of Wisconsin; M.S. 1933, Ph.D. 1935, University of Illinois

Harry Robert Page, *Professor Emeritus of Business Administration*
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, American University

Kittie Fenley Parker, *Professor Emeritus of Botany*
B.A. 1930, M.A. 1932, University of California, Berkeley; Ph.D. 1946, University of Arizona

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1926, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Blake Smith Root, *Professor Emeritus of Education*
B.S. 1927, Monmouth College, Illinois; M.A. 1931, University of Illinois; Ed.D. 1948, George Washington University

Edward Henry Sehrt, *Professor Emeritus of German*
B.A. 1911, Ph.D. 1915, Johns Hopkins University

Daniel Sinick, *Professor Emeritus of Education*
B.A. 1936, City University of New York, City College; M.A. 1937, State University of New York at Albany; Ph.D. 1955, New York University

Waldo Sommers, *Professor Emeritus of Public Administration*
B.A. 1927, Heidelberg College; M.A. 1934, Ph.D. 1948, Yale University

Edwin Lockwood Stevens, *Professor Emeritus of Speech*
B.A. 1936, Rutgers—The State University; M.A. 1942, Columbia University

Karl Ernest Stromsem, *Professor Emeritus of Public Administration*
B.A. 1930, Pomona College; Ph.D. 1935, University of California, Berkeley

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Ronald Bettes Thompson, *Professor Emeritus of European History*
B.A. 1935, Yale University; Ph.D. 1954, University of Chicago

Rodney Tillman, *Professor Emeritus of Education*
B.A. 1943, Henderson State College; M.A. 1949, Ed.D. 1955, Columbia University

Kathryn Mildred Towne, *Professor Emeritus of Home Economics*
B.S. 1923, Montana State University; M.A. 1930, Columbia University

Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

William Lewis Turner, *Associate Professor Emeritus of English*
B.A. 1934, M.A. 1941, Ph.D. 1952, University of Pennsylvania

Robert Corbin Vincent, *Professor Emeritus of Chemistry*
B.A. 1935, M.A. 1937, Ph.D. 1940, Cornell University

Robert Louis Weintraub, *Professor Emeritus of Botany*
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University

Edward Ronald Weismiller, *Professor Emeritus of English*
B.A. 1936, Litt.D. 1953, Cornell College; M.A. 1942, Harvard University; D.Phil. 1950, Oxford University

Warren Reed West, *Professor Emeritus of Political Science*
B.A. 1916, George Washington University; Ph.D. 1922, Johns Hopkins University

Ralph Kirby White, *Professor Emeritus of Social Psychology*
B.A. 1929, Wesleyan University; Ph.D. 1937, Stanford University

Marvin Milton Wofsey, *Professor Emeritus of Management*
B.S. 1935, New York University; M.A. 1943, Ph.D. 1967, American University

Helen Bates Yakobson, *Professor Emeritus of Russian*
B.S. 1935, Harbin Law School, Manchuria

Donnell Brooks Young, *Professor Emeritus of Zoology*
B.S. 1911, Amherst College; Ph.D. 1923, Columbia University

ACTIVE*

Robert D. Abbott, *Associate Professorial Lecturer in Statistics*
B.S. 1972, Western Michigan University; M.P.H. 1974, M.A. 1974, Ph.D. 1977, University of Michigan

Fred Paul Abramson, *Professor of Pharmacology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Eugene Abravanel, *Professor of Psychology*
B.A. 1955, University of Michigan; M.A. 1960, Swarthmore College; Ph.D. 1963, University of California, Berkeley

Jeanne Vermilyea Ackerman, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1948, Russell Sage College; M.A. in Ed. 1972, George Washington University

Arvil Van Adams, *Research Professor of Education Policy and of Economics*
B.A. 1965, M.B.A. 1966, Memphis State University; M.A. 1968, Ph.D. 1970, University of Kentucky

Elizabeth Byrne Adams, *Professor of Management*
B.S. 1955, City University of New York, Queens College; M.A. in Ed. 1957, George Washington University; Ph.D. 1974, American University

William Clayton Adams, *Associate Professor of Public Administration*
B.A. 1971, M.A. 1972, Baylor University; Ph.D. 1977, George Washington University

Lewis Francis Affronti, *Professor of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1956, Duke University

Yoshio Akiyama, *Associate Professorial Lecturer in Mathematics*
M.A. 1960, Andrews University; Ph.D. 1967, University of Minnesota

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

* The University Faculty is composed of the President of the University, the Vice President for Academic Affairs, the Director of Admissions, the Registrar, the University Librarian, the Treasurer, the Director of the Student Health Service, and the membership of the several college and school faculties.

John D. Albertson, *Adjunct Assistant Professor of Music*
B.M. 1961, Catholic University of America

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Dean Conrad Allard, *Professorial Lecturer in History*
B.A. 1955, Dartmouth College; M.A. 1959, Georgetown University; Ph.D. 1967, George Washington University

John Gage Allee, Jr., *Professor of English*
B.A. 1939, M.A. 1940, George Washington University; Ph.D. 1955, Johns Hopkins University

Catherine Allen, *Assistant Professor of Anthropology*
B.A. 1969, St. John's College, Maryland; M.A. 1972, Ph.D. 1978, University of Illinois

David Aron Altshuler, *Associate Professor of Religion in the Charles E. Smith Chair of Judaic Studies*
B.A., M.A. 1971, Brown University; Ph.D. 1977, Hebrew Union College

*Frederick Amling, *Professor of Business Finance*
B.A. 1948, Baldwin-Wallace College; M.B.A. 1949, Miami University; Ph.D. 1957, University of Pennsylvania

Alex Anckonie III, *Lecturer in Business Administration*
B.S. 1959, University of Michigan; M.B.A. 1981, American University

Jeffrey Clifford Anderson, *Associate Professor of Art*
B.A. 1970, University of Pittsburgh; M.F.A. 1973, Ph.D. 1976, Princeton University

Rebecca Jane Anderson, *Associate Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1975, Georgetown University

W. French Anderson, *Adjunct Professor of Genetics*
B.A. 1956, M.D. 1963, Harvard University; M.A. 1960, Cambridge University

William A. Anderson, *Assistant Professor of Economics*
B.A. 1974, Yale University; M.A. 1980, Cornell University

Avery DeLano Andrews, *Associate Professor of History; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1950, Harvard University; LL.B. 1953, M.A. 1958, Ph.D. 1962, University of Pennsylvania

Dennis P. Andrulis, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1969, Fordham University; Ph.D. 1973, University of Texas; M.P.H. 1976, University of North Carolina

John Lawrence Angel, *Professorial Lecturer in Anatomy and Anthropology*
B.A. 1936, Ph.D. 1942, Harvard University

Ruth Claude Ansel, *Assistant Professorial Lecturer in Art*
B.A. 1977, M.F.A. 1980, George Washington University

Joseph Paul Ansell, *Assistant Professorial Lecturer in Art*
B.A. 1971, Knox College; M.F.A. 1975, George Washington University

David Victor Appel, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1972, Bennington College; M.A. 1977, Goddard College

Daniel Appleman, *Professorial Lecturer in Geology*
B.S. 1953, California Institute of Technology; M.A. 1954, Ph.D. 1956, Johns Hopkins University

Ghassan M. Arnaoot, *Professorial Lecturer in Business Administration*
B.B.A. 1960, University of Cairo; Ph.D. 1970, University of Texas

Peter Aron, *Instructor in Clinical Law; Assistant Director, Division of Experimental Programs*
B.A. 1967, Oberlin College; J.D. 1972, Harvard University

Joseph Aschheim, *Professor of Economics*
B.A. 1951, University of California, Berkeley; M.A. 1953, Ph.D. 1954, Harvard University

Muriel Ann Atkin, *Associate Professor of History*
B.A. 1967, Sarah Lawrence College; M.Phil 1971, Ph.D. 1976, Yale University

* On sabbatical leave spring semester 1984.

David Lynn Atkins, *Professor of Biology*
B.A. 1957, University of Texas; M.A. 1963, East Texas State University; Ph.D. 1970, Texas A&M University

A.M. Attallah, *Adjunct Professor of Genetics*
B.S. 1967, Alexandria University, Egypt; D.E.A. 1971, University of Paris; Ph.D. 1974, George Washington University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

Ines Azar, *Associate Professor of Spanish*
M.A. 1969, Ph.D. 1974, Johns Hopkins University

William Back, *Adjunct Professor of Geology*
B.S. 1946, University of Illinois; M.S. 1955, University of California, Berkeley; M.P.A. 1956, Harvard University; Ph.D. 1969, University of Nevada

Barbara A. Bailar, *Professorial Lecturer in Statistics*
B.A. 1956, State University of New York at Albany; M.S. 1965, Virginia Polytechnic Institute and State University; Ph.D. 1972, American University

Higgins D. Bailey, *Adjunct Professor of Human Kinetics and Leisure Studies*
B.A. 1952, Eastern Washington State University; M.A. 1962, Ed.D. 1966, University of California, Berkeley

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

Robert Edward Baker, *Professor of Education; Assistant Dean of the School of Education and Human Development*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University of America; M.A. in Ed. 1956, Ed.D. 1962, George Washington University

David Norman Balaam, *Visiting Assistant Professor of Political Science*
B.A. 1972, California State University, Chico; M.A. 1974, Ph.D. 1978, University of California, Santa Barbara

Judith Banister, *Assistant Professorial Lecturer in Geography*
B.A. 1965, Swarthmore College; Ph.D. 1978, Stanford University

Lois W. Banner, *Associate Professorial Lecturer in History*
B.A. 1960, University of California, Los Angeles; M.A. 1962, Ph.D. 1970, Columbia University

Michael M. Barch, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1972, M.A. 1974, University of Southwestern Louisiana

Ruth Lillian Aaronson Bari, *Professor of Mathematics*
B.A. 1939, City University of New York, Brooklyn College; M.A. 1943, Ph.D. 1966, Johns Hopkins University

Shirley Russell Barnett, *Associate Professor of Spanish*
B.A. 1944, Vassar College; M.A. 1946, Vanderbilt University; Ph.D. 1958, University of Minnesota

Albert Barnhart, *Assistant Professorial Lecturer in Art*
B.A. 1970, University of Maryland; M.A. 1974, State University of New York College at Oswego

Theodore M. Barnhill, *Assistant Professor of Business Administration*
B.S. 1968, Tennessee Technological University; M.S. 1969, M.B.A. 1971, Ph.D. 1974, University of Michigan

James Richard Barth, *Professor of Economics*
B.A. 1965, California State University at Sacramento; M.A. 1967, University of New Mexico; Ph.D. 1972, Ohio State University

Elio Lee Battaglia, *Assistant Professorial Lecturer in Photography*
B.J. 1968, M.A. 1969, University of Missouri

William A. Bayse, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1958, Roanoke College; M.S. 1973, American University

Barbara Louise Bean, *Assistant Professor of Pharmacology*
B.S. 1970, University of Surrey; Ph.D. 1976, University of London

DeLawrence Beard, *Assistant Professorial Lecturer in Forensic Sciences*
J.D. 1970, University of Baltimore; LL.M. 1977, Georgetown University

Lucille Bluso Beck, *Assistant Professorial Lecturer in Speech and Drama*
B.A. 1971, Adelphi University; M.A. 1973, Ph.D. 1978, University of Maryland

Sylven Seid Beck, *Associate Professorial Lecturer in Education*
B.A. 1972, Marymount Manhattan College; M.S. in Ed. 1974, City University of New York, City College; Ed.D. 1981, George Washington University

*William H. Becker, *Professor of History*
B.A. 1964, Muhlenberg College; Ph.D. 1969, Johns Hopkins University

Robert Pryor Beliles, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1954, M.S. 1958, University of Louisville; Ph.D. 1962, Iowa State University

Peter Ben Ezra, *Assistant Professorial Lecturer in Accounting*
B.S. 1972, University of Maryland; M.S. in Adm. 1975, George Washington University

Otto Bergmann, *Professor of Physics*
Ph.D. 1948, University of Vienna

Edward Berkowitz, *Associate Professor of History*
B.A. 1972, Princeton University; M.A. 1973, Ph.D. 1978, Northwestern University

Robert A. Beverage, *Assistant Professorial Lecturer in Business Administration*
B.A. 1961, Colgate University; M.B.A. 1973, American University; D.B.A. 1981, George Washington University

*Lee Sheward Bielski, *Professor of Speech*
B.S. 1940, Ohio University; M.A. 1944, University of Michigan

Paul Philip Biemer, *Associate Professorial Lecturer in Statistics*
B.S. 1972, M.S. 1975, Ph.D. 1978, Texas A&M University

Philip Stanley Birnbaum, *Professor of Health Services Administration and of Health Care Sciences; Dean of the Medical Center, for Administrative Affairs*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E. 1964, Rensselaer Polytechnic Institute

Guy Black, *Professor of Business Economics*
B.S. 1941, Harvard University; M.A. 1948, Ph.D. 1951, University of Chicago

Mario I. Blejer, *Associate Professorial Lecturer in Economics*
B.A. 1970, M.A. 1972, Hebrew University; M.A. 1973, Ph.D. 1975, University of Chicago

Sherman Bloom, *Professor of Pathology*
B.A. 1955, M.D. 1960, New York University

Charlotte Renee Blount, *Associate Professorial Lecturer in Journalism*
B.A. 1974, American University

Elliot Blum, *Associate Clinical Professor of Psychology*
B.B.A. 1958, City University of New York, City College; M.S. 1960, Long Island University; Ph.D. 1965, Florida State University

Jeffrey Blumenfeld, *Assistant Professorial Lecturer in Forensic Sciences*
J.D. 1973, University of Pennsylvania

Martin Blumenson, *Professorial Lecturer in International Affairs*
B.A. 1939, M.A. 1940, Bucknell University; M.A. 1942, Harvard University

Joel David Bobula, *Lecturer in Health Services Administration*
B.A. 1974, Carnegie-Mellon University; M.A. 1976, University of Pittsburgh

Clarence E. Bohn, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1938, Michigan State University; J.D. 1950, Georgetown University

Ronald Carl Bohn, *Assistant Professor of Anatomy*
B.S. 1973, M.S. 1976, Pennsylvania State University; Ph.D. 1980, State University of New York Upstate Medical Center

Margaret Stanley Boone, *Associate Professorial Lecturer in Anthropology*
B.A. 1966, George Washington University; M.Ed. 1970, University of Florida; M.A. 1975, Ph.D. 1977, Ohio State University

John Borriello, *Clinical Professor of Psychology*
B.A. 1952, M.Ed. 1953, Boston University; Ph.D. 1957, University of Minnesota

David A. Bositis, *Assistant Professor of Political Science*
B.A. 1979, Northwestern University; M.A. 1976, Ph.D. 1981, Southern Illinois University

John Gordon Boswell, *Professor of Education*
B.A. in Ed. 1953, M.A. in Ed. 1956, Ed.D. 1963, George Washington University

* On sabbatical leave spring semester 1984.

Bryan L. Boulier, *Associate Professor of Economics*
B.A. 1967, North Carolina State University; M.A. 1969, Ph.D. 1974, Princeton University

Lloyd Spencer Bowling, *Professor of Speech and Hearing*
B.A. 1954, M.A. 1957, Ed.D. 1964, University of Maryland

George Robert Bozzini, *Associate Professor of English*
B.S. 1961, Ph.D. 1971, Georgetown University

Michael D. Bradley, *Assistant Professor of Economics*
B.S. 1975, University of Delaware; Ph.D. 1982, University of North Carolina

Linda Brandt, *Associate Professor of Psychology*
B.A. 1963, Elmhurst College; M.A. 1965, Clark University; Ph.D. 1973, University of London

James Lowell Breen, *Professor of Human Kinetics and Leisure Studies*
B.S. 1946, Eastern Illinois University; M.S. 1949, Ph.D. 1959, University of Illinois

Mary Diane Majerus Brewer, *Associate Professor of Speech*
B.A. 1963, M.A. 1965, University of Iowa

Harold Frederick Bright, *Professor of Statistics; Provost and Vice President for Academic Affairs*
B.A. 1937, Lake Forest College; M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas

William John Briscoe, *Assistant Professor of Physics*
B.A. 1970, Ph.D. 1978, Catholic University of America; M.A. 1972, Northeastern University

A.D. Britt, *Professor of Chemistry*
B.S. 1957, West Texas State University; M.A. 1961, Ph.D. 1963, Washington University

James Thomas Broach, *Assistant Professorial Lecturer in Physics*
B.S. 1969, Louisiana State University; M.S. 1975, Ph.D. 1981, American University

John Caruthers Broderick, *Adjunct Professor of English*
B.A. 1948, Southwestern at Memphis; M.A. 1949, Ph.D. 1953, University of North Carolina

David Michael Brody, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1960, Harvard University; M.D. 1961, University of Virginia

Michael George Bromley, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1966, Medical College of South Carolina

Alison Spence Brooks, *Associate Professor of Anthropology*
B.A. 1965, Radcliffe College; M.A. 1967, Ph.D. 1979, Harvard University

David Alan Brown, *Professorial Lecturer in Art*
B.A. 1964, Harvard University; M.A. 1967, Ph.D. 1973, Yale University

David Springer Brown, *Professor of Management*
B.A. 1936, University of Maine at Orono; Ph.D. 1955, Syracuse University

Frederick James Brown, Jr., *Professor of Education*
B.A. 1947, M.Ed. 1951, Western Maryland College; Ed.D. 1962, Columbia University

Kenneth Michael Brown, *Assistant Professor of Biology*
B.S. 1973, Ph.D. 1982, Michigan State University; M.S. 1975, University of Florida

Robert Guy Brown, *Professor of Sociology*
B.A. 1949, University of Rhode Island; M.A. 1951, Ph.D. 1960, University of North Carolina

Carol Elder Bruce, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1971, J.D. 1974, George Washington University

David Brusick, *Adjunct Assistant Professor of Genetics*
B.S. 1963, University of Illinois; M.S. 1965, Ph.D. 1970, Illinois State University

Ben Burdetsky, *Professor of Personnel and Labor Relations*
B.S. 1950, M.S. 1956, Temple University; Ph.D. 1966, American University

Elisabeth Ann Burkhardt, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1966, University of Maryland

James Franklin Burks, *Professor of French*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Indiana University

John Robert Burns, *Associate Professor of Zoology*
B.S. 1968, City University of New York, Brooklyn College; M.S. 1972, Ph.D. 1974, University of Massachusetts

*Martha Burns, *Professor of Education*
B.S. 1964, University of Bridgeport; M.Ed. 1967, Ed.D. 1971, Pennsylvania State University

* On sabbatical leave academic year 1983-84.

Barbara Burns-Shostak, *Clinical Instructor in Art Therapy*
B.A. 1977, Clark University; M.A. 1979, George Washington University

Martin Alexander Buzas, *Adjunct Professor of Geology*
B.A. 1958, University of Connecticut; M.S. 1960, Brown University; Ph.D. 1963, Yale University

Willard Edmund Caldwell, *Professor of Psychology*
B.A. 1940, M.A. 1941, University of Florida; Ph.D. 1946, Cornell University

Peter George Callas, *Assistant Professorial Lecturer in Education*
B.A. 1949, M.A. 1955, Western Maryland College; Ed.D. 1972, George Washington University

Gerard Caprio, Jr., *Associate Professorial Lecturer in Economics*
B.A. 1972, Williams College; M.A. 1974, Ph.D. 1976, University of Michigan

*Edward Alan Caress, *Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1958, Dartmouth College; Ph.D. 1963, University of Rochester

Albert Jason Caron, *Research Professor of Psychology*
M.A. 1949, Ph.D. 1954, University of Chicago

Rose Friedman Caron, *Adjunct Professor of Psychology*
B.A. 1948, Vassar College; M.A. 1950, Ph.D. 1955, University of Chicago

Oliver T. Carr, Jr., *Visiting Lecturer in Urban Development Planning*

Gerald Vincent Carroll, *Professor of Geology*
B.A. 1943, Lehigh University; Ph.D. 1952, Yale University

Thomas Frank Carroll, *Adjunct Professor of Economics*
B.A. 1942, Case Western Reserve University; M.S. 1947, Ph.D. 1950, Cornell University

Barbara Gilbert Carson, *Assistant Professorial Lecturer in American Civilization and in Art History*
B.A. 1963, Brown University; M.A. 1965, University of Delaware

John H. Carson, *Associate Professor of Management Science*
B.S. in E.E. 1969, M.S. 1970, Ph.D. 1976, Lehigh University

Geoffrey Carter, *Assistant Professor of English*
B.A. 1963, Cambridge University; Ph.D. 1969, University of Pennsylvania

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Michael Scott Castleberry, *Associate Professor of Special Education*
B.A. 1966, University of North Carolina; M.A. in Ed. 1972, Ed.D. 1973, George Washington University

†Bayard Lacey Catron, *Associate Professor of Public Administration*
B.A. 1963, Grinnell College; M.A. 1965, University of Chicago; M.C.P. 1972, Ph.D. 1975, University of California, Berkeley

Giorgia Emma Cavallaro, *Studio Instructor in Guitar*
B.A. 1979, Glassboro State College; M.M. 1982, Catholic University of America

Peter James Caws, *University Professor of Philosophy*
B.Sc. 1952, University of London; M.A. 1954, Ph.D. 1956, Yale University

Charles Blaine Cecil, *Professorial Lecturer in Geology*
B.S. 1960, M.S. 1966, Ph.D. 1969, West Virginia University

Soo Young Cha, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1961, Seoul National University

Charles McKay Chambers, *Professorial Lecturer in Mathematics*
B.S. 1962, M.S. 1963, Ph.D. 1964, University of Alabama; J.D. 1976, George Washington University

Marjorie Helen Charlop, *Assistant Professor of Psychology*
B.A. 1976, University of California, Los Angeles; M.A. 1979, Ph.D. 1981, Claremont Graduate School

Jonathan Chaves, *Associate Professor of Chinese*
B.A. 1965, City University of New York, Brooklyn College; M.A. 1966, Ph.D. 1971, Columbia University

Stephen Reed Chitwood, *Professor of Public Administration*
B.A. 1962, University of Colorado; M.P.A. 1965, Ph.D. 1966, University of Southern California; J.D. 1977, George Washington University

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* On sabbatical leave spring semester 1984.
† On sabbatical leave academic year 1983-84.

Robert Paul Churchill, *Associate Professor of Philosophy*
B.A. 1969, M.A. 1972, Ph.D. 1974, Johns Hopkins University

Ira Hubert Cisin, *Professor of Sociology*
B.S. 1939, New York University; M.A. 1951, Ph.D. 1957, American University

Astere Evarist Claeyssens, Jr., *Associate Professor of English*
B.A. 1946, University of Illinois; M.A. 1952, Columbia University

James E. Clair, *Lecturer in Health Services Administration*
B.S. 1967, University of Detroit; M.B.A. 1971, Xavier University

Morris S. Clark, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1952, Indiana University; M.F.S. 1953, Harvard University

Lucille Clifton, *Jenny McKean Moore Visiting Lecturer in Creative Writing*
D.H.L. 1980, Towson State University; D.H.L. 1980, University of Maryland

Anthony George Coates, *Professor of Geology*
B.S. 1959, Ph.D. 1963, University of London

Joseph Francis Coates, *Adjunct Professor of Public Affairs*
B.S. 1951, Polytechnic Institute of New York; M.S. 1953, Pennsylvania State University

Vary Taylor Coates, *Adjunct Professor of Public Affairs*
B.A. 1957, Furman University; M.A. 1966, Ph.D. 1972, George Washington University

Mary Ann Bieter Coffland, *Associate Professor of Romance Languages*
B.A. 1952, College of St. Catherine; M.A. 1957, Ph.D. 1965, University of Minnesota

Frances Ethel Cohen, *Studio Instructor in Opera*
B.F.A. 1953, Bennington College

*Neil G. Cohen, *Assistant Professor of Business Administration*
B.A. 1963, Olivet College; M.B.A. 1964, University of Michigan; D.B.A. 1975, University of Virginia

Stanley Lee Cohen, *Professorial Lecturer in Psychology*
B.A. 1963, M.A. 1966, Ph.D. 1971, George Washington University

Steven Bruce Cohen, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1973, City University of New York, Brooklyn College; M.S. 1976, Ph.D. 1978, University of North Carolina

Victor Hugo Cohn, *Professor of Pharmacology*
B.S. 1952, Lehigh University; M.A. 1954, Harvard University; Ph.D. 1961, George Washington University

James Coldsmith, *Professorial Lecturer in Journalism*
B.A. 1950, Baker University; M.S.J. 1951, Northwestern University

Frederick Joseph Collier, *Assistant Professorial Lecturer in Geology*
B.S. 1958, Tufts University

Dale Richard Collins, *Professorial Lecturer in Public Administration*
B.A. 1964, Case Western Reserve University; M.P.A. 1966, D.P.A. 1970, Syracuse University

Robert Long Combs, *Associate Professor of English*
B.A. 1968, University of Southern Mississippi; Ph.D. 1971, University of South Carolina

Bruce Edward Committe, *Assistant Professor of Accounting*
B.A. 1974, University of West Florida; M.A. 1978, University of Alabama

Drew K. Conger, *Clinical Instructor in Art Therapy*
B.A. 1951, Wellesley College; M.A. 1978, George Washington University

Frank Bernard Conlon, *Adjunct Assistant Professor of Music*
B.M. 1967, M.M. 1969, Catholic University of America

Suzanne Durling Cook, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1973, University of Maryland; M.A. 1982, George Washington University

Gerri Charleen Coons, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1970, M.S. 1975, Indiana University

Joseph John Cordes, *Associate Professor of Economics*
B.A. 1971, Stanford University; M.S. 1975, Ph.D. 1977, University of Wisconsin

†Constance Christian Costigan, *Assistant Professor of Design*
B.S. 1957, Simmons College; M.A. 1966, American University

Raymond Sheary Cottrell, Jr., *Professor of Special Education*
B.S. 1955, State University of New York at Albany; M.S. 1959, Ed.D. 1967, Syracuse University

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* On sabbatical leave fall semester 1983.
† On sabbatical leave academic year 1983-84.

Raymond Leslie Courage, *Associate Professorial Lecturer in Journalism*
B.A. 1949, M.A. 1951, University of Michigan

Thomas Francis Courtless, Jr., *Professor of Law and Sociology*
B.A. 1955, Pennsylvania State University; M.A. 1960, Ph.D. 1966, University of Maryland

Andrea Jean Covarrubias, *Adjunct Instructor in English*
B.A. 1974, University of Pittsburgh; M.Ed 1978, Temple University

Carl Daniel Cox, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1976, University of Maryland

J. Joseph Coyne, *Associate Professorial Lecturer in Physics*
B.S. 1950, Loyola College; Ph.D. 1960, Catholic University of America

John Patrick Coyne, *Associate Professor of Management Science*
B.S. 1967, Iona College; M.S. 1968, Ph.D. 1970, Lehigh University

Marguerite G. Crabtree, *Assistant Professorial Lecturer in Anthropology*
B.A. 1974, University of California, Riverside; M.A. 1979, George Washington University

Pamela J. Cressey, *Adjunct Assistant Professor of American Civilization and of Anthropology*
B.A. 1968, University of California, Los Angeles; M.A. 1973, Ph.D. 1978, University of Iowa

Spencer R. Crew, *Adjunct Assistant Professor of History and American Civilization*
B.A. 1971, Brown University; M.A. 1973, Ph.D. 1979, Rutgers—The State University

Theodore Oscar Cron, *Associate Professorial Lecturer in Journalism*
B.A. 1952, M.A.T. 1954, Harvard University

Gary Edward Crum, *Associate Professor of Health Services Administration*
B.S. 1967, College of William and Mary; M.S. 1969, Ph.D. 1972, University of Kentucky; M.P.H. 1973, Columbia University; M.A. in Sp.Std. 1982, George Washington University

Ronald Crystal, *Adjunct Professor of Genetics*
B.A. 1962, Tufts University; M.S. 1963, M.D. 1968, University of Pennsylvania

Jonathan Walkley Cummings, *Associate Clinical Professor of Psychology*
B.A. 1949, University of Vermont; Ph.D. 1954, University of Illinois

Marcus Falkner Cunliffe, *University Professor*
B.A. 1944, M.A. 1946, B.Litt. 1947, Oxford University; M.A. 1963, University of Manchester; D.H.L. 1976, University of Pennsylvania; D.H.L. 1979, New England College

Cortlandt Beck Cunningham, *Professorial Lecturer in Forensic Sciences*
B.S. 1948, Northwestern University; J.D. 1954, Miami University; M.S. 1971, George Washington University

Phyllis Deutsch Daen, *Associate Clinical Professor of Psychology*
B.S. 1950, City University of New York, Queens College; Ph.D. 1960, Adelphi University

Dwight David Darland, *Professorial Lecturer in Education*
B.S. 1939, Nebraska State Teachers College; M.A. 1942, University of Wyoming; Ed.D. 1947, Columbia University

Kurt John Darr, *Professor of Health Services Administration*
B.A. 1961, Concordia College, Minnesota; J.D. 1964, M.H.A. 1966, University of Minnesota; D.Sc. 1973, Johns Hopkins University

Doris Seligson Davidoff, *Lecturer in Human Kinetics and Leisure Studies*
B.B.A. 1962, Adelphi University; M.A. 1978, George Washington University

Philip Gardner Davidoff, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, M.A. 1963, University of Pennsylvania

Herbert John Davis, *Associate Professor of Business Administration*
B.S. 1965, Villanova University; M.B.A. 1968, East Carolina University; Ph.D. 1974, Louisiana State University

*Roderic Hollett Davison, *Professor of European History*
B.A. 1937, Princeton University; M.A. 1938, Ph.D. 1942, Harvard University

James Deakin, *Adjunct Associate Professor of Journalism*
B.A. 1951, Washington University

Christopher James Deering, *Assistant Professor of Political Science*
B.A. 1974, University of Southern California; M.A. 1975, Ph.D. 1979, University of California, Santa Barbara

* On sabbatical leave academic year 1983-84.

Frank Landt Dennis, *Professorial Lecturer in Journalism*
B.A. 1929, University of Oklahoma; LL.B. 1935, Harvard University

Linda Grant DePauw, *Professor of American History*
B.A. 1961, Swarthmore College; Ph.D. 1964, Johns Hopkins University

Jessie Carleton Calver Dickens, *Associate Professorial Lecturer in Biological Sciences*
B.A. 1939, M.S. 1969, George Washington University

Thomas Dietz, *Assistant Professor of Sociology*
B.Gen.St. 1972, Kent State University; Ph.D. 1979, University of California, Davis

Susannah Dillman, *Lecturer in Mathematics*
B.A. 1968, Tufts University; M.S. 1973, Oregon State University

Audrey Jane DiMaria, *Lecturer in Art Therapy*
B.A. 1971, Keene State College; M.A. 1977, George Washington University

*Salvatore Frank Divita, *Professor of Business Administration*
B.I.E. 1953, New York University; M.B.A. 1956, Ohio State University; D.B.A. 1968, Harvard University

Douglas S. Dixon, *Associate Professorial Lecturer in Forensic Sciences*
M.D. 1971, University of Virginia

John K. Donaldson, Jr., *Adjunct Instructor in English*
B.A. 1956, University of Rochester; M.A. 1957, Middleburg College; M.S. 1980, Georgetown University

Robert Paul Donaldson, *Assistant Professor of Biology*
B.A. 1964, University of Texas; M.S. 1966, Miami University; Ph.D. 1971, Michigan State University

Miriam Violet Wein Dow, *Assistant Professor of English*
B.A. 1959, University of Akron; M.A. 1960, University of Michigan; Ph.D. 1977, University of Maryland

William Drohan, *Adjunct Associate Professor of Genetics*
B.A. 1969, Ph.D. 1974, University of California, Los Angeles

Robert Martin Dunn, Jr., *Professor of Economics*
B.A. 1960, Williams College; M.A. 1963, Ph.D. 1967, Stanford University

Prabha Durgapal, *Visiting Assistant Professor of Physics*
B.Sc. 1967, M.Sc. 1969, Jodhpur University, India; Ph.D. 1982, Ohio University

Brian W. Dwyer, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, Georgetown University; M.B.A. 1979, Golden Gate University

Robert Frederick Dyer, *Professor of Business Administration*
B.S. in B.A. 1965, M.B.A. 1966, Bowling Green State University; D.B.A. 1972, University of Maryland

John Joseph Dziak, *Professorial Lecturer in International Affairs*
B.A. 1961, M.A. 1964, Seton Hall University; Ph.D. 1971, Georgetown University

Elizabeth M. Earley, *Adjunct Associate Professor of Genetics*
B.S. 1953, Chestnut Hill College; M.S. 1968, Ph.D. 1971, Tulane University

Roy Brandon Eastin, *Professor of Business Administration*
B.A. 1943, M.A. 1945, George Washington University; Ph.D. 1953, American University

Robert Eliot Easton, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1962, J.D. 1965, Columbia University

Russell Eaton III, *Associate Professorial Lecturer in Physics*
B.A. 1962, M.A. 1964, Miami University; Ph.D. 1974, George Washington University

Ellen W. Echeverria, *Adjunct Instructor in English*
B.A. 1963, Fairleigh Dickinson University; M.A. 1969, Middlebury College

Pablo Echeverria, *Assistant Professorial Lecturer in Mathematics*
B.S. 1975, M.A. 1977, University of Puerto Rico; M.A. 1980, University of Maryland

William Charles Eckelman, *Professor of Radiology*
B.S. 1963, St. Louis University; M.A. 1966, Ph.D. 1968, Washington University

William Henry Eddy, *Lecturer in Special Education*
B.S. 1969, St. Cloud University; M.A. 1974, George Washington University

Paul Francis Edgar, *Studio Instructor in Percussion*
B.Mus.Ed. 1971, University of Miami; M.M. 1974, Catholic University of America

---

* On sabbatical leave fall semester 1983.

David Lee Edgell, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1961, University of Kansas; B.A. 1968, American University; M.A. 1970, Indiana University; Ph.D. 1976, University of Cincinnati

Martha B. Edmondson, *Adjunct Instructor in English*
B.A. 1969, Ohio Wesleyan University; M.Ed. 1972, Rutgers—The State University

John Eftis, *Professor of Engineering and Applied Science and Adjunct Professor of Mathematics*
B.C.E. 1952, City University of New York, City College; M.S. in C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

Kenneth E. Eickmann, *Assistant Professorial Lecturer in Mathematics*
B.S. 1967, University of Texas; M.S. 1968, Air Force Institute of Technology

Julian Eisenstein, *Professor of Physics*
B.S. 1941, M.A. 1942, Ph.D. 1948, Harvard University

Adel El-Ansary, *Professor of Business Administration*
B.Com. 1962, Cairo University, Egypt; M.B.A. 1968, Ph.D. 1970, Ohio State University

Marlene Kay Elbin, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1967, University of Maryland

Robert Moore Eldridge, *Lecturer in Business Administration*
B.S. 1960, U.S. Naval Academy; M.S. in Adm. 1975, George Washington University

Rodney Walter Eldridge, *Professor of International Finance*
B.A. 1949, M.A. 1950, University of Vermont; Ph.D. 1966, Columbia University

Charles Fox Elliott, *Associate Professor of Political Science and International Affairs*
B.A. 1953, Ph.D. 1964, Harvard University; M.A. 1958, University of California, Berkeley

Lloyd Hartman Elliott, *Professor of Higher Education; President of the University*
B.A. 1937, Glenville State College; M.A. 1939, LL.D. 1967, West Virginia University; Ed.D. 1948, University of Colorado; LL.D. 1963, University of New Hampshire; LL.D. 1965, Colby College; LL.D. 1966, Concord College; LL.D. 1969, University of Maine at Orono; LL.D. 1971, Georgetown University

Wanda Kay Ellis, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1967, University of North Carolina at Greensboro; M.A. in Ed. 1978, George Washington University

Michael J. Enders, *Assistant Professor of Urban and Regional Planning*
B.S. 1966, M.S. 1968, M.S. 1969, University of Wisconsin; M.A. 1976, Ph.D. 1979, Clark University

Ernest Julius Englander, *Assistant Professor of Business Administration*
B.A. 1974, M.S. 1979, M.B.A. 1982, University of Washington

Richard Ferdinand Ericson, *Professor of Management*
B.A. 1943, M.B.A. 1948, University of Chicago; Ph.D. 1952, Indiana University

Amitai Etzioni, *University Professor*
B.A. 1954, M.A. 1956, Hebrew University; Ph.D. 1958, University of California, Berkeley

Dorothy Alita Evans, *Associate Clinical Professor of Psychology*
B.S. 1963, University of Illinois; M.A. 1966, Ph.D. 1968, Southern Illinois University

Grace Elizabeth Orvis Evans, *Professorial Lecturer in Art*
B.A. 1943, M.A. 1948, University of Minnesota

Grose Evans, *Adjunct Associate Professor of Art*
B.F.A. 1939, M.A. 1940, Ohio State University; Ph.D. 1953, Johns Hopkins University

Robert Kent Evans, *Assistant Professorial Lecturer in Anthropology*
B.A. 1965, University of Illinois; M.A. 1967, Ph.D. 1973, University of California, Los Angeles

Donald Frank Eversmann, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1967, Cornell University; M.B.A. 1972, Southern Illinois University

Shawki M. Farag, *Professorial Lecturer in Accounting*
B.Com. 1960, Cairo University; M.S. 1963, Ph.D. 1967, University of Illinois; M.A. 1965, Yale University

Andrea Helen Farbman, *Instructor in Human Kinetics and Leisure Studies*
B.S. 1974, M.A. 1976, University of Maryland; Ed.D. 1982, George Washington University

Harvey B. Feigenbaum, *Assistant Professor of Political Science*
B.A. 1971, University of Virginia; M.A. 1974, C.Phil. 1977, Ph.D. 1981, University of California, Los Angeles

Bernice Feinstein, *Assistant Professorial Lecturer in Music*
B.A. 1947, Smith College; M.A. 1958, Ed.D. 1972, Columbia University

Reynolds Ferrante, *Professor of Education*
B.S. 1957, Glassboro State College; M.Ed. 1961, Rutgers—The State University; Ed.D. 1974, Pennsylvania State University

Sima Ficks, *Assistant Professorial Lecturer in Russian*
Diploma 1964, Kiev State University

Cynthia Field, *Associate Professorial Lecturer in American Civilization*
B.A. 1963, Bryn Mawr College; M.A. 1967, Ph.D. 1974, Columbia University

Jonathan D. Fife, *Associate Professor of Education*
B.B.A. 1965, University of Massachusetts; M.S. 1970, State University of New York at Albany; Ed.D. 1975, Pennsylvania State University

Nicolae Filipescu, *Professor of Chemistry*
Ph.D. 1957, University of Industrial Chemistry, Polytechnical Institute, Rumania; Ph.D. 1964, M.D. 1975, George Washington University

Mary Baker Findley, *Studio Instructor in Violin*
B.M. 1965, M.M. 1966, D.M.A. 1974, University of Cincinnati

Pamela Finnerty-Fried, *Assistant Professor of Education*
B.A. 1971, M.Ed. 1974, Ed.S. 1974, University of Florida; Ph.D. 1981, Florida State University

Penelope Peterson Fischer, *Studio Instructor in Flute*
Mus.B. 1966, University of Iowa; Mus.M. 1970, University of Michigan

Elizabeth Ann Fisher, *Associate Professor of Classics*
B.A. 1966, Northwestern University; M.A. 1971, Ph.D. 1972, Harvard University

Keith Allan Fleming, *Studio Instructor in Cello*
B.M. 1973 University of Maryland, M.M. 1977, Ph.D. 1979, Catholic University of America

Marilyn Fleming, *Adjunct Assistant Professor of Art Therapy*
B.F.A. 1954, University of Illinois; M.A. 1975, George Washington University

John Raymond Fogarty, *Associate Professorial Lecturer in Journalism*
B.S. 1966, University of Baltimore

Vincy Fon, *Assistant Professor of Economics*
B.A. 1971, Wisconsin State University; M.A. 1975, M.A. 1977, Ph.D. 1981, University of Kansas

William Robert Fonda, *Associate Professorial Lecturer in Journalism*

Ernest Harvey Forman, *Professor of Management Science*
B.S. 1964, University of Rochester; M.S. 1969, Johns Hopkins University; D.Sc. 1975, George Washington University

Thomas Mark Fortuin, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1967, J.D. 1971, Columbia University

John Davidson Frame, *Associate Professor of Management Science*
B.A. 1967, College of Wooster; M.A. 1969, Ph.D. 1976, American University

Michael J. Francis, *Assistant Professorial Lecturer in Art*
B.F.A. 1973, The Maryland Institute, College of Art; M.F.A. 1978, George Washington University

Alan D. Franklin, *Professorial Lecturer in Anthropology*
B.A. 1946, Ph.D. 1949, Princeton University

Richard E. French, *Professorial Lecturer in Economics*
B.B.A. 1961, M.A. 1963, Ph.D. 1967, University of Oklahoma

Roderick Stuart French, *Professor of Philosophy; Director, Division of Experimental Programs*
B.A. 1954, Kenyon College; B.D. 1957, Episcopal Theological School; S.T.M. 1965, Union Theological Seminary; Ph.D. 1971, George Washington University

Maxine Benjamin Freund, *Assistant Professor of Special Education*
B.A. 1968, University of Minnesota; M.A. 1973, Ed.D. 1981, George Washington University

John Andrew Frey, *Professor of Romance Languages*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Catholic University of America

R. Scott Frey, *Assistant Professor of Sociology*
B.S. 1973, Northwest Missouri State University; M.A. 1976, Drake University; Ph.D. 1980, Colorado State University

Gary Ira Friend, *Lecturer in Business Administration*
B.B.A. 1979, M.B.A. 1979, George Washington University

Marilyn Wong Fu, *Visiting Assistant Professor of Art*
B.A. 1964, Mount Holyoke College; M.A. 1970, Ph.D. 1982, Princeton University

Stephen Souther Fuller, *Professor of Urban and Regional Planning*
B.A. 1962, Rutgers—The State University; M.C.P. 1964, University of Mississippi; Ph.D. 1969, Cornell University

Dennis Earl Gale, *Associate Professor of Urban and Regional Planning*
B.A. 1964, Bucknell University; M.S. 1968, Boston University; M.Ed. 1969, Harvard University; M.C.P. 1971, University of Pennsylvania; Ph.D. 1982, George Washington University

*Michael Graham Gallagher, *Professor of Accounting*
B.A. in Govt. 1960, J.D. 1964, LL.M. 1971, George Washington University; C.P.A. 1965, State of Virginia

Linda Lou Gallo, *Associate Professor of Biochemistry*
B.S. 1959, West Virginia University; M.S. 1963, Ph.D. 1969, George Washington University

Robert Charles Gallo, *Adjunct Professor of Genetics*
B.A. 1959, Providence College; M.D. 1963, Thomas Jefferson University

Robert Norton Ganz, Jr., *Professor of English*
B.A. 1949, M.A. 1951, Ph.D. 1960, Harvard University

Nathan Conant Garner, *Assistant Professor of Drama*
B.A. 1963, Tufts University; M.A. 1966, University of North Carolina

Carleton Theodore Garrett, *Associate Professor of Pathology*
B.A. 1962, Lehigh University; M.D. 1966, Johns Hopkins University; Ph.D. 1977, University of Wisconsin

Marilyn Mangold Garst, *Adjunct Assistant Professor of Music*
Mus.B. 1962, University of Southern California; Mus.M. 1964, Indiana University; Ph.D. 1972, Michigan State University

Joseph Lewis Gastwirth, *Professor of Statistics and Economics*
B.S. 1958, Yale University; M.A. 1960, Princeton University; Ph.D. 1963, Columbia University

Harry Irving Gates, *Associate Professor of Sculpture*
B.F.A. 1958, M.F.A. 1960, University of Illinois

Alfonso Geiger, *Associate Professorial Lecturer in Geology*
B.S. 1950, University of Michigan

Lyndale Harpster George, *Associate Professor of Human Kinetics and Leisure Studies*
B.S. in P.E. 1948, M.A. in Ed. 1952, A.P.C. 1961, George Washington University

Fariborz Ghadar, *Professor of Business Administration*
B.S.(C.E.) 1968, B.S. 1969, M.S.(M.E.) 1970, Massachusetts Institute of Technology; M.B.A. 1972, D.B.A. 1975, Harvard University

Phyllis Eleanor Gieseler, *Studio Instructor in Voice*

†Howard Frank Gillette, Jr., *Associate Professor of American Civilization*
B.A. 1964, Ph.D. 1970, Yale University

Gerald Lee Gimelstob, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1971, University of Rhode Island, M.S. 1973, Indiana University

Leon Gintzig, *Professor of Hospital Administration; Associate Dean of the School of Government and Business Administration*
B.S. 1947, Boston University; M.S. 1954, Northwestern University; Ph.D. 1958, University of Iowa

Bruce Willard Given, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1959, Kansas State University; M.S.F.S. 1975, George Washington University

Audrey L. Glassman, *Assistant Professorial Lecturer in Art*
B.F.A. 1946, Syracuse University; M.F.A. 1975, American University

Bernard Sholom Glassman, *Associate Professorial Lecturer in Art*
B.S. 1943, Harvard University

Edmund John Gleazer, Jr., *Visiting Professor of Education*
B.A. 1938, University of California, Los Angeles, Ed.M. 1943, Temple University; Ed.D. 1953, Harvard University

Irving Isadore Glick, *Associate Professor of Mathematics*
B.A. 1953, Johns Hopkins University; Ph.D. 1961, University of Maryland

Leo R. Goldbaum, *Professorial Lecturer in Forensic Sciences*
B.S. 1934, City University of New York, Brooklyn College; M.S. 1938, New York University; Ph.D. 1950, George Washington University

---

* On sabbatical leave spring semester 1984.
† On sabbatical leave academic year 1983-84.

Jacob Goldberg, *Visiting Professor of Middle East Studies*
LL.B. 1972, B.A. 1973, Tel Aviv University; M.A. 1975, Ph.D. 1978, Harvard University

Joe Jeff Goldblatt, *Lecturer in Human Kinetics and Leisure Studies*
B.F.A. 1974, St. Edward's University

Robert Stanley Goldfarb, *Professor of Economics*
B.A. 1964, Columbia University; M.A. 1965, M.Phil. 1967, Ph.D. 1968, Yale University

Allan L. Goldstein, *Professor of Biochemistry*
B.S. 1959, Wagner College; M.S. 1961, Ph.D. 1964, Rutgers—The State University

*Victor Karl Golla, *Associate Professor of Anthropology*
B.A. 1960, Ph.D. 1970, University of California, Berkeley

Charles Vance Gordon, Jr., *Associate Professorial Lecturer in Health Services Administration*
B.A. 1967, University of Colorado; Ph.D. 1971, Washington University

Marvin Gordon, *Professor of Geography and Regional Science*
B.A. 1942, City University of New York, City College; M.A. 1954, Ph.D. 1966, Columbia University

Lois Graff, *Associate Professor of Management Science*
B.A. 1964, Mundelein College; M.S. 1965, Ph.D. 1969, New York University; M.B.A. 1979, University of Illinois

Florence George Graves, *Associate Professorial Lecturer in Journalism*
B.S. in Ed. 1968, University of Texas; M.A. 1978, University of Arizona

Marvin David Green, *Associate Professor of Mathematics*
B.S. 1961, M.A. 1962, Ph.D. 1965, University of Cincinnati

Susan Kay Green, *Associate Professor of Psychology*
B.A. 1971, Michigan State University; M.A. 1973, Ph.D. 1975, Loyola University of Chicago

Mary Ita Greenbaum, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1958, University of Maryland; M.C.A.T. 1978, Hahnemann Medical College

Joseph Arthur Greenberg, *Professor of Education*
B.S. in Bus. Ed. 1966, Salem State College; Ed.M. 1968, Ed.D. 1974, Boston University

Warren Greenberg, *Associate Professor of Health Services Administration*
B.A. 1964, Temple University; M.A. 1965, University of Pennsylvania; Ph.D. 1972, Bryn Mawr College

Sherwin Greene, *Associate Professor of Urban and Regional Planning*
B.Arch. 1959, M.S. in C.R.P. 1960, Illinois Institute of Technology; M.F.A. 1982, George Washington University

Samuel W. Greenhouse, *Professor of Statistics*
B.S. 1938, City University of New York, City College; M.A. 1954, Ph.D. 1956, George Washington University

Fuller Griffith, *Assistant Professor of Graphics*
B.S. 1952, University of Wisconsin; M.F.A. 1969, George Washington University

William Byron Griffith, *Associate Professor of Philosophy*
B.A. 1958, University of Notre Dame; M.A. 1962, Ph.D. 1963, Yale University

Carl Michael Grimaldi, *Clinical Instructor in Art Therapy*
B.A. 1970, Hiram Scott College; M.A. 1980, George Washington University

Linda C. Grow, *Assistant Professorial Lecturer in Biological Sciences*
B.S. 1966, University of Wisconsin; M.A. 1973, Ph.D. 1979, George Washington University

Phillip Donald Grub, *Aryamehr Professor of Multinational Management*
B.A., B.A. in Ed. 1953, Eastern Washington State College; M.B.A. 1960, D.B.A. 1964, George Washington University

Francis Stanley Grubar, *Professor of Art*
B.A. 1948, M.A. 1949, University of Maryland; M.A. 1952, Ph.D. 1966, Johns Hopkins University

Joseph Grunwald, *Adjunct Professor of Economics*
B.S. 1943, Johns Hopkins University; Ph.D. 1950, Columbia University

Marina Keet Grut, *Lecturer in Human Kinetics and Leisure Studies*

Eileen Morris Guenther, *Studio Instructor in Organ*
B.A., Mus.B. 1970, University of Kansas; M.A., D.M.A. 1973, Catholic University of America

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* On sabbatical leave academic year 1983-84.

Roy James Guenther, *Assistant Professor of Music*
B.Mus.Ed. 1966, Mus.B. 1968, University of Kansas; M.A. 1974, Ph.D. 1979, Catholic University of America

Murli Manohar Gupta, *Associate Professor of Mathematics*
B.S. 1963, M.S. 1965, Agra University, India; M.S. 1969, Ph.D. 1971, University of Saskatchewan, Canada

Frederick Gutheim, *Adjunct Professor of Urban Planning and American Civilization*
B.A. 1931, University of Wisconsin; D.P.S. 1979, George Washington University

*Andrew Gyorgy, *Professor of International Affairs and Political Science*
B.A. 1937, J.D. 1938, University of Budapest; M.A. 1939, University of California, Berkeley; Ph.D. 1943, University of California, Los Angeles

Sheldon Edward Haber, *Professor of Economics*
B.A. 1954, City University of New York, City College; Ph.D. 1958, Johns Hopkins University

John T. Hack, *Professorial Lecturer in Geology*
B.A. 1935, M.A. 1938, Ph.D. 1940, Harvard University

Eleanor Martha Hadley, *Adjunct Professor of Economics*
B.A. 1938, Mills College; M.A. 1943, Ph.D. 1949, Harvard University

Neil Blaine Hadley, *Associate Professorial Lecturer in Health Services Administration*
B.A. 1949, University of Northern Iowa; M.H.A. 1958, Baylor University; M.S. 1962, Arizona State University; D.B.A. 1971, George Washington University

Robert Arthur Hadley, *Associate Professor of History*
B.A. 1959, Bowdoin College; M.A. 1960, Ph.D. 1964, University of Pennsylvania

Michael Ivan Haftel, *Assistant Professorial Lecturer in Physics*
B.S. 1965, Pennsylvania State University; Ph.D. 1969, University of Pittsburgh

E. William Hahn, *Associate Professor of Management Science*
B.S. 1963, M.S. 1965, Ph.D. 1969, Purdue University

Walter A. Hahn, Jr., *Visiting Professor of Public Affairs*
B.S. 1949, New York University; M.A. 1954, American University

William Emitt Halal, *Professor of Management Science*
B.S. 1956, Purdue University; M.B.A. 1970, Ph.D. 1971, University of California, Berkeley

Max Halperin, *Research Professor of Statistics*
B.S. 1940, University of Omaha; M.S. 1941, University of Iowa; Ph.D. 1950, University of North Carolina

William Charles Handorf, *Professor of Business Administration*
B.A. 1966, M.B.A. 1967, University of Michigan; Ph.D. 1973, Michigan State University

Gloria L. Harbin, *Assistant Professor of Special Education*
B.S. in Ed. 1967, Indiana University; M.Ed. 1972, Ph.D. 1980, University of North Carolina

William Walter Hardgrave, *Associate Professor of Management Science*
B.A. 1959, Princeton University; D.Engr. 1962, Johns Hopkins University

John Hardt, *Adjunct Professor of Economics*
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Michael Mont Harmon, *Professor of Public Administration*
B.A. 1963, Utah State University; M.P.A. 1966, Ph.D. 1968, University of Southern California

Edmund Patrick Harper, *Associate Professor of Physics*
B.S. 1965, University College, Dublin; M.S. 1969, Ph.D. 1972, Purdue University

John Kent Harper, *Associate Professorial Lecturer in Psychology*
B.A. 1967, University of South Florida; M.S. 1969, University of Tennessee; Ph.D. 1976, George Washington University

Jeffrey Harris, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1965, New York University; J.D. 1968, Syracuse University

Jo Francis Harrop, *Assistant Professorial Lecturer in Art*
B.S. 1947, Mount Mary College; M.F.A. 1976, George Washington University

Jerry Harvey, *Professor of Management Science*
B.B.A. 1957, Ph.D. 1963, University of Texas

Shahin Hashtroudi, *Associate Professor of Psychology*
B.A. 1971, American University of Beirut; Ph.D. 1976, State University of New York at Stony Brook

* On sabbatical leave fall semester 1983.

Richard Catlin Haskett, *Professor of American History*
B.A. 1940, M.A. 1941, Indiana University; M.A. 1948, Ph.D. 1952, Princeton University

Declan Charles Haun, *Associate Professorial Lecturer in Journalism*

Oli Havrylyshyn, *Professor of Economics*
B.A. 1966, Queen's University, Canada; Ph.D. 1972, Massachusetts Institute of Technology

Donald Hawkins, *Professor of Human Kinetics and Leisure Studies and Research Professor of Medicine*
B.A. 1958, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, New York University

Rolf Hayn, *Professorial Lecturer in Economics*
B.A. 1944, Indiana University; Ph.D. 1954, University of Wisconsin

Janet Craig Heddesheimer, *Professor of Education*
B.A. 1965, Coe College; M.A. 1968, Ph.D. 1971, Ohio State University

Arnost Heidrich, *Associate Professorial Lecturer in Mathematics*
B.S. 1962, George Washington University; M.A. 1966, Ph.D. 1978, University of Maryland

James T. Heimbach, *Associate Professorial Lecturer in Business Administration*
B.A. 1966, Haverford College; M.S. 1968, Ph.D. 1971, Purdue University

James T. Heisler, *Associate Professorial Lecturer in Business Administration*
B.A. 1968, University of Michigan; M.A. 1970, DePaul University; Ph.D. 1974, Illinois Institute of Technology

Kiki B. Hellman, *Adjunct Assistant Professor of Biological Sciences*
B.S. 1954, University of Akron; M.S. 1956, University of Michigan; Ph.D. 1977, George Washington University

Jeffrey R. Henig, *Assistant Professor of Political Science*
B.A. 1973, Cornell University; Ph.D. 1977, Northwestern University

Charles Joseph Herber, *Associate Professor of European History*
B.A. 1952, Dickinson College; M.A. 1957, Ph.D. 1965, University of California, Berkeley

Gilbert Richard Herer, *Professor of Child Health and Development and of Audiology*
B.S. 1953, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

Susan Hertz, *Associate Professorial Lecturer in Anthropology*
B.A. 1968, Stanford University; M.A. 1969, Ph.D. 1974, University of Minnesota

Julia Elizabeth Hicks, *Assistant Professor of Spanish*
B.A. 1940, M.A. 1947, University of Tennessee, Knoxville

Lloyd W. Hicks, *Assistant Professorial Lecturer in Art*
B.A. 1958, William and Mary College; M.F.A. 1974, American University

Philip Henry Highfill, Jr., *Professor of English*
B.A. 1942, Wake Forest University; M.A. 1948, Ph.D. 1950, University of North Carolina

Peter Proal Hill, *Professor of History*
B.A. 1949, Tufts University; M.A. 1954, Boston University; Ph.D. 1966, George Washington University

James William Hillis, *Professor of Speech*
B.S. 1952, University of Nebraska; M.A. 1957, University of Maryland; Ph.D. 1963, Ohio State University

Joseph Hilmy, *Professor of Accounting*
B.Com. 1947, M.S. 1954, Ph.D. 1959, University of Aberdeen

Alfred John Hiltebeitel, *Professor of Religion*
B.A 1963, Haverford College; M.A. 1966, Ph.D. 1973, University of Chicago

Dorothea Mabel Hiltenbrand, *Instructor in Special Education*
B.A 1974, George Peabody College; M.A. 1977, George Washington University

Harold Clendenin Hinton, *Professor of Political Science and International Affairs*
B.A. 1948, M.A. 1948, Ph.D. 1961, Harvard University

Harold Lester Hirsh, *Professorial Lecturer in Health Services Administration*
M.D. 1942, Georgetown University; J.D. 1972, American University

Denis Michael Hitchcock, *Associate Professor of Art*
B.A. 1967, University of California, Los Angeles; M.F.A. 1970, Ph.D. 1977, Princeton University

Carol H. Hoare, *Assistant Professor of Education*
B.S. 1962, Carlow College; M.S. 1964, University of North Carolina; Ed D. 1980, George Washington University

Herman Hedberg Hobbs, *Professor of Physics*
B.S. 1953, M.S. 1955, George Washington University; Ph.D. 1958, University of Virginia

Harold A. Hoffman, *Professorial Lecturer in Biological Sciences*
B.S. 1957, M.A. 1960, Ph.D. 1962, University of California, Berkeley

Robert Lee Holland, *Associate Professor of Business Administration*
B.S. 1951, M.S. 1956, University of Tennessee, Knoxville; Ph.D. 1960, Texas A&M University

Mary Alida Holman, *Professor of Economics*
B.A. 1955, M.A. 1957, Ph.D. 1963, George Washington University

Dennis Howard Holmes, *Associate Professor of Education*
B.A. 1962, California State University, San Jose; M.A. 1971, Wayne State University; Ed.D. 1978, University of Southern California

Robert William Holmstrom, *Associate Professor of Psychology*
B.A. 1956, Trinity College, Connecticut; Ph.D. 1965, Duke University

Gloria Lyon Horrworth, *Professor of Education*
B.A. 1952, California State University, Los Angeles; M.A. 1961, California State University, Northridge; Ed.D. 1972, American University

James O. Horton, *Associate Professor of American History and Civilization*
B.A. 1964, State University of New York at Buffalo; M.A. 1970, University of Hawaii; Ph.D. 1973, Brandeis University

Nicholas Hotton, *Professorial Lecturer in Geology*
B.S. 1947, Ph.D. 1960, University of Chicago

Edmund G. Howe, *Professorial Lecturer in Forensic Sciences*
B.A. 1966, Yale University; M.D. 1970, Columbia University; J.D. 1976, Catholic University of America

Paula Howie, *Clinical Instructor in Art Therapy*
B.F.A. 1969, University of North Carolina at Greensboro; M.A. 1975, George Washington University

Ching-Yao Hsieh, *Professor of Economics*
B.A. 1939, St. John's University, China; M.A. 1958, Ph.D. 1964, George Washington University

Kun-yen Huang, *Professor of Microbiology*
M.D. 1959, National Taiwan University; Ph.D. 1967, George Washington University

Maxwell White Hudgins, Jr., *Assistant Professorial Lecturer in Business Administration*
B.S. 1968, Ph.D. 1973, University of Virginia

Terry Lee Hufford, *Associate Professor of Botany*
B.S. 1961, M.A. 1962, Bowling Green State University; Ph.D. 1972, Ohio State University

Rudolph Hugh, *Professor of Microbiology*
B.S. 1948, Michigan State University; Ph.D. 1954, Loyola University of Chicago

*Edwin Lee Hullander, *Associate Professor of Business Administration*
B.S. 1960, Tennessee Technological University; M.S. 1969, M.S. 1971, Ph.D. 1972, Iowa State University

John Paul Hume, *Associate Professorial Lecturer in Forensic Sciences*
B.B.A. 1964, University of Notre Dame; J.D. 1970, George Washington University

Robert Lee Humphrey, Jr., *Professor of Anthropology*
B.A. 1962, American University; Ph.D. 1970, University of New Mexico

John D. Hunt, *Professor of Human Kinetics and Leisure Studies*
B.S. 1959, M.F. 1962, University of Idaho; Ph.D. 1971, Colorado State University

Gérard Paul Huvé, *Assistant Professor of French*
B.A. 1963, American University; M.A. 1969, University of Maryland

Robert Nicholas Ianacone, *Associate Professor of Special Education*
B.S. 1968, M.S. 1971, State University of New York at Buffalo; Ed.D. 1976, University of Florida

Gary R. Irby, *Assistant Professorial Lecturer in Art*
B.S. 1965, Eastern Illinois University; M.F.A. 1969, George Washington University

Clarence Terrance Ireland, *Professorial Lecturer in Statistics*
B.A. 1960, Cornell University; Ph.D. 1966, George Washington University

Norman Murray Irvine, *Studio Instructor in Bass*
B.S. in Mus.Ed. 1955, M.Ed. in Mus.Ed. 1962, University of Maryland

Rita Klein Ives, *Professor of Special Education*
B.S. 1953, University of Pittsburgh; M.A. in Ed. 1957, Ed.S. 1967, Ed.D. 1971, George Washington University

* On leave of absence academic year 1983-84.

David Iwamoto, *Professorial Lecturer in Education*
B.A. 1947, Walla Walla College; M.A. 1948, Columbia Union College; M.A. in Ed. 1962, Ed.D. 1963, George Washington University

Kenneth T. Jackson, *Banneker Professor of Washington Studies; Visiting Professor of History*
B.A. 1961, Memphis State University; M.A. 1963, Ph.D. 1966, University of Chicago

Michael John Jackson, *Professor of Physiology*
B.S. 1953, University of London; Ph.D. 1956, Sheffield University

Robert Joseph Kassel Jacob, *Associate Professorial Lecturer in Statistics*
B.A. 1972, M.S.E. 1974, Ph.D. 1978, Johns Hopkins University

Cecil Bryant Jacobson, *Adjunct Associate Professor of Genetics*
B.S. 1960, University of Utah; M.D. 1964, George Washington University

Lawrence R. Jacobson, *Assistant Professorial Lecturer in Economics*
B.A. 1974, University of Michigan; M.A. 1978, Ph.D. 1979, Stanford University

Leslie Bravman Jacobson, *Assistant Professor of Speech*
B.S. 1970, Northwestern University; M.F.A. 1974, Boston University

N. Richard Janis, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1968, University of Wisconsin; J.D. 1972, Harvard University

Kristine M. Jensch, *Clinical Instructor in Art Therapy*
B.A. 1971, Columbia University; M.A. 1979, George Washington University

Alvin Carl Jensen, *Professorial Lecturer in Education; Associate Dean of the Division of Continuing Education and Summer Sessions*
Ed.B. 1956, University of Wisconsin—Whitewater; M.A. in Ed. 1960, Ed.D. 1967, George Washington University

Diana Entwisle Johnson, *Associate Professor of Biology*
B.A. 1970, Cornell College; Ph.D. 1975, University of Chicago

Kurt Edward Johnson, *Associate Professor of Anatomy*
B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Nancy Diers Johnson, *Associate Professor of Human Kinetics and Leisure Studies*
B.S. 1955, University of Minnesota; M.A. 1966, University of Iowa; Ed.D. 1980, University of North Carolina at Greensboro

Patricia Ann McHale Johnson, *Adjunct Instructor in English*
B.A. 1964, Immaculate Heart College; M.A. 1980, American University

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

William Reid Johnson, *Associate Professor of History*
B.A. 1951, Oberlin College; M.A. 1955, Ph.D. 1961, University of Washington

Hal Stanely Jones, *Assistant Professorial Lecturer in Accounting*
B.A. 1975, University of Washington; M.B.A. 1977, University of Chicago

Robert Gean Jones, *Professor of Religion; University Marshal*
B.A. 1947, Baylor University; B.D. 1950, M.A. 1957, Ph.D. 1959, Yale University

Jeffrey Harold Joseph, *Associate Professorial Lecturer in Business Administration*
B.A. 1966, George Washington University; J.D. 1973, University of Baltimore; M.A. 1974, University of Pennsylvania

Eva Scheyer Jospe, *Associate Professorial Lecturer in Religion*
M.A. 1963, Georgetown University

Arnold Robert Josselson, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1963, Kalamazoo College; M.D. 1968, Wayne State University

Christopher Clayton Joyner, *Assistant Professor of Political Science*
B.A. 1970, M.A. 1972, M.A. 1973, Florida State University; Ph.D. 1977, University of Virginia

Hugo Dietrich Junghenn, *Professor of Mathematics*
B.S. 1964, Albright College; M.A. 1967, Villanova University; Ph.D. 1971, George Washington University

Robert Konrad Kahn, *Professorial Lecturer in Psychology*
B.A. 1948, University of Pennsylvania; M.A. 1953, George Washington University; Ph.D. 1957, Pennsylvania State University

David Sidney Kamerling, *Assistant Professorial Lecturer in Geography*
B.A. 1971, University of Houston; M.A. 1975, Syracuse University

Daniel R. Kane, *Assistant Professor of Business Administration*
B.S. 1953, George Washington University; B.S.F.S. 1954, J.D. 1956, LL.M. 1964, Georgetown University

William Michael Kane, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1969, Northwest Missouri State University; M.S. 1970, University of Utah; Ph.D. 1977, University of Oregon

Stephen Arnold Karp, *Associate Professor of Psychology*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1952, New School for Social Research; Ph.D. 1962, New York University

Irving Katz, *Professor of Mathematics*
B.S. 1956, City University of New York, Brooklyn College; M.A. 1958, Ohio State University; Ph.D. 1964, University of Maryland

Marvin Stewart Katzman, *Assistant Professor of Business Administration*
B.B.S. 1955, University of Louisville; M.B.A. 1974, D.B.A. 1981, George Washington University

Samuel Kavruck, *Professor of Education*
B.S. 1937, M.S. in Ed. 1939, City University of New York, City College; M.A. in Govt. 1950, Ed.D. 1954, George Washington University

Joanne K. Kelleher, *Assistant Professor of Physiology*
B.S. 1969, St. Louis University; M.A. 1972, Ph.D. 1976, Boston University

Thomas Francis Kelleher, Jr., *Professorial Lecturer in Forensic Sciences*
B.S. 1950, Fordham University

Steven Keller, *Assistant Professor of Speech*
B.S. 1968, M.A. 1969, Ohio State University

Eugene Walter Kelly, Jr., *Professor of Education; Dean of the School of Education and Human Development*
B.A. 1958, M.Div. 1962, Josephinum College; M.Ed. 1969, Ph.D. 1971, University of South Carolina

John Whitefield Kendrick, *Professor of Economics*
B.A. 1937, M.A. 1939, University of North Carolina; Ph.D. 1955, George Washington University

Robert Emmet Kennedy, Jr., *Professor of European History*
B.A. 1959, Johns Hopkins University; M.A 1965, Boston College; Ph.D. 1973, Brandeis University

Richard Alec Kenney, *Professor of Physiology*
B.S. 1943, Ph.D. 1947, University of Birmingham

*Robert Wayne Kenny, *Professor of History*
B.J. 1953, University of Texas; M.A. 1957, University of Minnesota; Ph.D. 1963, University of Chicago

Stephen Gabriel Kent, *Associate Professor of Pathology*
B.A. 1956, M.D. 1960, Case Western Reserve University

Hewitt Kenyon, *Professor of Mathematics*
B.S. 1942, Ph.D. 1954, University of California, Berkeley

Margot Starr Kernan, *Associate Professorial Lecturer in Art*
B.A. 1948, Bennington College; M.A. 1966, San Francisco State University

Norayr Krikor Khatcheressian, *Associate Professor of Physics*
B.A. 1960, M.A. 1963, George Washington University; Ph.D. 1966, University of Virginia

Najat Khelil, *Associate Professorial Lecturer in Physics*
B.S. 1960, Cairo University; M.S. 1965, Ohio State University; Ph.D. 1974, North Texas State University

James Bernard Kiesel, *Lecturer in Human Kinetics and Leisure Studies*
B.S. in E.E. 1972, University of Pittsburgh; M.S. in E.E. 1974, University of Maryland

Gershon Raphael Kieval, *Adjunct Assistant Professor of Political Science*
B.A. 1975, Harvard University; M.A. 1977, Ph.D. 1980, Johns Hopkins University

Sura Kang Kim, *Adjunct Assistant Professor of Music*
B.A. 1949, Ewha University, Korea; Mus.B. 1950, Baldwin-Wallace College; Mus.M. 1952, Manhattan School of Music

Young Kim, *Professor of Political Science and International Affairs*
M.A. 1956, Vanderbilt University; Ph.D. 1958, University of Pennsylvania

* On sabbatical leave spring semester 1984.

Taeko Kimura, *Lecturer in Japanese*
B.A. 1965, Kumamoto Women's University, Japan

Phyllis Dawn Kind, *Professor of Microbiology and of Medicine*
B.A. 1955, Montana State University; M.S. 1956, Ph.D. 1960, University of Michigan

Carleton W. King III, *Studio Instructor in Recorder*
Mus.B. 1969, East Carolina University; Mus.M. 1976, University of Maryland

James Cecil King, *Professor of German*
B.A. 1949, M.A. 1950, Ph.D. 1954, George Washington University

Michael King, *Associate Professor of Chemistry*
B.S. 1966, Illinois Institute of Technology; M.A. 1967, Ph.D. 1970, Harvard University

Ronald Franklyn Kirby, *Associate Professorial Lecturer in Urban and Regional Planning*
B.S. 1963, B.S. 1964, Ph.D. 1969, University of Adelaide

Nancy Isner Kirkendall, *Associate Professorial Lecturer in Statistics*
B.S. 1965, M.S. 1967, Ohio State University; Ph.D. 1974, George Washington University

Margaret R. Kirkland, *Adjunct Instructor in English*
B.A. 1969, Mary Baldwin College; M.A. 1977, Georgetown University

Arthur David Kirsch, *Professor of Statistics and of Psychology*
B.A. 1955, George Washington University; M.S. 1956, Ph.D. 1957, Purdue University

Peter Flindell Klarén, *Professor of History*
B.A. 1960, Dartmouth College; M.A. 1964, Ph.D. 1968, University of California, Los Angeles

Devra Gail Kleiman, *Adjunct Associate Professor of Psychology*
B.S. 1964, University of Chicago; Ph.D. 1969, University of London

David Klingman, *Associate Professor of Political Science*
B.A. 1966, University of Texas; M.A. 1967, University of Wisconsin; Ph.D. 1973, Michigan State University

*Philip Klubes, *Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College; M.S. 1959, Ph.D. 1963, University of Minnesota

Paul LeRoy Knight, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1973, M.A. 1975, George Washington University

Sara Jane Blakemore Knight, *Assistant Professorial Lecturer in Education*
B.A. 1955, College of William and Mary; M.Ed. 1974, Virginia Polytechnic Institute and State University

Mark R. Knowles, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1962, Boston University; M.P.H. 1970, University of Pittsburgh

Robert Earle Knowlton, *Associate Professor of Biology; Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1960, Bowdoin College; Ph.D. 1970, University of North Carolina

Maritta Koch-Weser, *Associate Professorial Lecturer in Anthropology*
Ph.D. 1975, Rheinische Friedrich Wilhelms Universitaet, Germany

Marilyn Jean Koering, *Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Miran Haig Kojian, *Studio Instructor in Violin*
M.M. 1966, Catholic University of America

Alicia Hawkins Kopfstein-Penk, *Studio Instructor in Guitar*
B.M. 1972, M.A. 1976, American University

Louis Sampson Kornicker, *Adjunct Professor of Biological Sciences*
B.S. 1941, B.S. 1942, University of Alabama; M.A. 1954, Ph.D. 1957, Columbia University

Sandra Lynn Koskoff, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1971, Western Maryland College; M.L.S. 1976, University of Maryland

John Theodore Kotelly, *Assistant Professorial Lecturer in Forensic Sciences*
B.A.E. 1960, Rensselaer Polytechnic Institute, J.D. 1967, Georgetown University

Edith Kramer, *Adjunct Associate Professor of Art Therapy*

Elaine S. Kramer, *Clinical Instructor in Art Therapy*
B.A. 1970, University of Maryland; M.A. 1981, George Washington University

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* On sabbatical leave spring semester 1984.

Alcira I. G. Kreimer, *Associate Professorial Lecturer in Urban and Regional Planning*
M.A. 1966, University of Buenos Aires, Argentina; Ph.D. 1977, University of California, Berkeley

Kenneth Krell, *Adjunct Associate Professor of Genetics*
B.A. 1954, University of Pittsburgh; M.S. 1967, Ph.D. 1970, Columbia University

Donald E. Kreps, *Assistant Professorial Lecturer in Business Administration*
B.A. 1963, Duke University; M.B.A. 1975, George Mason University; D.B.A. 1981, George Washington University

Dean Krueger, *Research Professor of Statistics and of Ophthalmology*
B.A. 1938, M.A. 1942, University of Chicago; M.S. 1959, Columbia University

Ruth Marilyn Krulfeld, *Professor of Anthropology*
B.A. 1956, Brandeis University; Ph.D. 1974, Yale University

Edwin Paul Kulawiec, *Professor of Education*
B.S. 1950, Bethany College, West Virginia; M.A. 1956, Seton Hall University; M.A.T. 1961, Indiana University; Ph.D. 1971, University of Wisconsin

Joseph H. Kullback, *Professorial Lecturer in Statistics*
B.A. 1955, George Washington University; M.S. 1957, Ph.D. 1961, Stanford University

Ajit Kumar, *Associate Professor of Biochemistry*
Ph.D. 1966, University of Chicago

Frederick Charles Kurtz, *Professor of Accounting*
B.S. in Com. 1948, University of Virginia; M.B.A. 1949, University of Pennsylvania; C.P.A. 1952, State of Maryland

John E. Kwoka, Jr., *Associate Professor of Economics*
B.A. 1967, Brown University; Ph.D. 1971, University of Pennsylvania

Irene Kyriakopoulos, *Associate Professor of Economics*
B.S. 1970, University of Maryland; M.A. 1972, Ph.D. 1977, George Washington University

John Marion Lachin III, *Research Professor of Statistics*
B.S. 1965, Tulane University of Louisiana; Sc.D. 1972, University of Pittsburgh

Melvin Paul Lader, *Assistant Professor of Art*
B.A. 1969, M.A. 1973, State University of New York at Albany; Ph.D. 1981, University of Delaware

Mitchell L. Laine, *Assistant Professorial Lecturer in Accounting*
B.B.A. 1973, University of Michigan; M.B.A. 1981, Wayne State University

Jerry Lee Lake, *Associate Professor of Photography*
B.F.A. 1966, Virginia Commonwealth University; M.F.A. 1968, Ohio University

Carl James Lange, *Professor of Psychology; Vice President for Administration and Research*
B.S. 1945, Duke University; M.S. 1948, Ph.D. 1951, University of Pittsburgh

JoAnne Lanouette, *Adjunct Instructor in Anthropology*
B.S. 1967, University of Minnesota; M.A. 1976, George Washington University

Nicholas Lappas, *Associate Professor of Forensic Sciences*
B.A. 1964, Thiel College; M.S. 1973, Ph.D. 1975, Duquesne University

Daniel E. Laufenberg, *Assistant Professorial Lecturer in Business Administration*
B.S. 1969, University of Wisconsin–Platteville; Ph.D. 1973, Iowa State University

Geza Peter Lauter, *Professor of Business Administration*
B.A. 1954, Institute for Foreign Languages, Hungary; B.A. 1962, M.B.A. 1964, Ph.D. 1968, University of California, Los Angeles

Robert Alan Lavine, *Associate Professor of Physiology and of Neurology*
B.S. 1962, Ph.D. 1969, University of Chicago

Thelma Z. Lavine, *Elton Professor of Philosophy*
B.A. 1936, Radcliffe College; M.A. 1937, Ph.D. 1939, Harvard University

William Medley Lawbaugh, *Professorial Lecturer in Journalism*
B.A. 1965, M.A. 1967, St. Louis University; Ph.D. 1972, University of Missouri

Edward Pitt Lawson, *Assistant Professorial Lecturer in Art*
B.A. 1951, Bowdoin College; M.A. 1955, New York University

William Matthew Leach, *Adjunct Professor of Genetics*
B.A. 1956, Berea College; M.S. 1962, Ph.D. 1965, University of Tennessee, Knoxville

Linda Jane Lear, *Associate Professorial Lecturer in History*
B.A. 1962, Connecticut College; M.A. 1964, Columbia University; Ph.D. 1974, George Washington University

Hugh Linus LeBlanc, *Professor of Political Science and Public Affairs*
B.A. 1948, Louisiana State University and Agricultural and Mechanical College; M.A. 1960, University of Tennessee, Knoxville; Ph.D. 1958, University of Chicago

James H. Lebovic, *Assistant Professor of Political Science*
B.A. 1973, California State University, Long Beach; M.A. 1975, Ph.D. 1981, University of Southern California

William Louis Lebovich, *Assistant Professorial Lecturer in Art*
B.A. 1970, Brandeis University; M.A. 1974, Boston University

Ann Lee, *Studio Instructor in Voice*
B.A. 1956, Seoul National University College of Music; Mus.M. 1959, New England Conservatory of Music

Davis Lin-chuan Lee, *Assistant Professor of Chinese*
B.S. 1955, Chung-Hsing University, Taiwan; M.S. 1959, University of Minnesota; Ph.D. 1979, Georgetown University

Dora Fugh Lee, *Lecturer in Chinese*

Myrna Pike Lee, *Associate Professor of Mathematics*
B.A. 1957, Cornell University; M.S. 1959, Ph.D. 1962, University of Illinois

W. David Lee, *Associate Professorial Lecturer in Physics*
B.S. 1963, Clemson University; Ph.D. 1970, University of Virginia

Young-Ho Lee, *Assistant Professorial Lecturer in Business Administration*
B.A. 1969, M.B.A. 1971, Seoul National University; D.B.A. 1981, George Washington University

Donald Richard Lehman, *Professor of Physics*
B.A. 1962, Rutgers—The State University; M.S. 1964, Air Force Institute of Technology; Ph.D. 1970, George Washington University

*Patricia Hilary Madoo Lengermann, *Professor of Sociology*
B.A. 1963, Oxford University; M.A. 1966, Ph.D. 1969, Cornell University

D. Jeffrey Lenn, *Associate Professor of Business Administration*
B.S. 1962, University of Pennsylvania; M.Div. 1966, Andover Newton Theological School; M.S. 1969, Yale University; Ph.D. 1981, Boston College

Sar Levitan, *Professor of Economics*
B.S.S. 1937, City University of New York, City College; M.A. 1939, Ph.D. 1949, Columbia University

Bernard Isaac Levy, *Professor of Psychology*
B.A. 1948, New York University; Ph.D. 1952, University of Rochester

Joseph Benjamin Levy, *Professor of Chemistry*
B.S. 1943, University of New Hampshire; M.S. 1945, Ph.D. 1948, Harvard University

Marvin Monroe Levy, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1971, City University of New York, Brooklyn College

Edwin Joseph Baughman Lewis, *Professor of Accounting*
B.A. 1938, University of Western Ontario; M.B.A. 1939, Northwestern University

John Frederick Lewis, *Professor of Geology*
B.S. 1959, M.S. 1960, Victoria University, New Zealand; D.Phil. 1964, Oxford University

William H. Lewis, *Visiting Professor of International Affairs*
B.A. 1951, M.A. 1953, George Washington University; Ph.D. 1960, American University

Samuel Robert Lichter, *Assistant Professor of Political Science*
B.A. 1969, University of Minnesota; Ph.D. 1977, Harvard University

Marilyn Louise Liebrenz, *Assistant Professor of Business Administration*
B.A. 1966, Wheaton College; M.A. 1973, Ph.D. 1980, Michigan State University

John W. Lightbody, Jr., *Associate Professorial Lecturer in Physics*
B.S. 1961, Rensselaer Polytechnic Institute; Ph.D. 1970, University of Maryland

Hubert Whitman Lilliefors, *Professor of Statistics*
B.A. 1952, Ph.D. 1964, George Washington University; M.A. 1953, Michigan State University

Edward R. Lilly, *Associate Professor of Education*
B.A. 1967, Morgan State University; M.S. 1971, City University of New York, City College; Ph.D. 1976, University of Connecticut

S. Donna Lind, *Associate Professor of Health Services Administration*
B.S. 1971, Portland State University; Ph.D. 1976, Brandeis University

* On sabbatical leave academic year 1983-84.

Carl Arne Linden, *Associate Professor of International Affairs and Political Science*
B.A. 1951, Syracuse University; M.A. 1956, Harvard University; Ph.D. 1966, George Washington University

*Roy Charles Lindholm, *Professor of Geology*
B.S. 1959, University of Michigan; M.A. 1963, University of Texas; Ph.D. 1967, Johns Hopkins University

Craig William Linebaugh, *Associate Professor of Speech and Associate Research Professor of Medicine*
B.A. 1970, Lebanon Valley College; M.A. 1974, Ph.D. 1975, Temple University

John P. Link, *Assistant Professor of Economics*
B.S. 1978, University of Illinois

Donald C. Linkowski, *Professor of Education*
B.A. 1961, M.S. 1963, Ph.D. 1969, State University of New York at Buffalo

Calvin Darlington Linton, *Professor of English; Dean of Columbian College of Arts and Sciences*
B.A. 1935, George Washington University, M.A. 1939, Ph.D. 1940, Johns Hopkins University

Lewis Lipnick, *Studio Instructor in Bassoon*
Mus.B. 1968, Peabody Institute of Baltimore

Gordon Leslie Lippitt, *Professor of Behavioral Sciences*
B.S. 1942, Litt.D. 1971, Springfield College; B.D. 1946, Yale University; M.A. 1947, University of Nebraska; Ph.D. 1959, American University

Diana Leigh Lipscomb, *Assistant Professor of Biology*
B.A. 1978, Agnes Scott College; Ph.D. 1982, University of Maryland

Thomas Phillip George Liverman, *Professor of Mathematics and Adjunct Professor of Engineering and Applied Science*
B.A. 1941, University of Montpellier; M.A. 1948, Ph.D. 1956, University of Pennsylvania

John Lobuts, Jr., *Associate Professor of Management Science; Assistant Dean of the School of Government and Business Administration*
B.S. 1957, Fairmont State College; M.A. in Ed. 1965, Ed.D. 1970, George Washington University

Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
B.A. 1958, M.B.A. 1967, D.B.A. 1971, George Washington University

John Mortimer Logsdon, *Professor of Public Affairs and Political Science*
B.S. 1960, Xavier University, Ohio; Ph.D. 1970, New York University

William Francis Edward Long, *Professor of Economics; Dean of the Division of Continuing Education and Summer Sessions*
B.A. 1946, M.A. 1947, Ph.D. 1967, George Washington University

Sebastian R. Lorigo, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1970, Philadelphia College of Textiles and Science; M.B.A. 1975, Widener College

Benjamin David Lourie, *Assistant Professorial Lecturer in Art*
B.A. 1971, Earlham College

John Carl Lowe, *Professor of Geography and Regional Science*
B.A. 1956, M.A. 1960, George Washington University; Ph.D. 1969, Clark University

Gregory Ludlow, *Associate Professor of French; Assistant Dean of Columbian College of Arts and Sciences*
Licence ès Lettres 1962, University of Paris; Ph.D. 1970, McGill University, Canada

Robert Alfred Luke, Jr., *Associate Professor of Education*
B.A. 1963, Colgate University; M.A. 1965, Ph.D. 1971, University of Maryland

Morton Lutzky, *Lecturer in Physics*
B.S. 1951, City University of New York, City College; M.S. 1959, University of Maryland

Donald C. Lynn, *Associate Professorial Lecturer in Art*
B.A. 1950, American University

James Lawrence Lyons, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1962, Wheeling College; J.D. 1967, Georgetown University

James Hunt Maddox, *Professor of English*
B.A. 1965, Princeton University; M.A. 1967, Ph.D. 1969, Yale University

* On sabbatical leave spring semester 1984.

Lynda Marie Maddox, *Assistant Professor of Business Administration*
B.A. 1972, M.A. 1974, Pennsylvania State University; Ph.D. 1978, Southern Illinois University

James Mahoney, Jr., *Associate Professorial Lecturer in Museum Studies*
B.F.A. 1958, Philadelphia College of Art

Wendy Maiorana, *Adjunct Assistant Professor of Art Therapy*
B.A. 1961, American University; M.A. 1976, George Washington University

Sharyn M. Mallamad, *Assistant Professorial Lecturer in Business Administration*
B.S. 1974, University of Toledo; M.S. 1977, Ph.D. 1980, University of Maryland

Paul Bernard Malone III, *Associate Professor of Business Administration; Assistant Dean of the School of Government and Business Administration, for Undergraduate Programs*
B.S. 1952, U.S. Military Academy; M.S. in Per.Ad. 1969, D.B.A. 1973, George Washington University

Barbara Katz Mandel, *Clinical Instructor in Art Therapy*
B.A. 1972, University of Rochester; M.A. 1975, George Washington University

Harold George Mandel, *Professor of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Wallace Harper Mann, *Studio Instructor in Flute*
Mus.B. 1943, Eastman School of Music

Sigmund Herbert Manne, *Associate Professorial Lecturer in Forensic Sciences*
B.S.S. 1948, City University of New York, City College; M.S. 1950, University of Miami; Ph.D. 1962, New York University

Edward Marasciulo, *Professorial Lecturer in Geography*
B.A. 1950, University of Miami

William Margrabe, *Assistant Professor of Business Administration*
B.A. 1970, Johns Hopkins University; Ph.D. 1978, University of Chicago

Emerson Markham, *Associate Professorial Lecturer in Public Administration*
B.A. 1951, Union College, New York; M.P.A. 1952, Syracuse University

Michael L. Marlow, *Associate Professor of Economics*
B.A. 1975, George Washington University; Ph.D. 1978, Virginia Polytechnic Institute and State University

Judith Perlman Martin, *Associate Professorial Lecturer in Journalism*
B.A. 1959, Wellesley College

Linda Lee Martin, *Lecturer in Education*
B.S. 1965, Texas Women's University; B.A. 1967, Central Bible College; M.A. 1970, New York University; M.A. 1975, Gallaudet College

Anne Masters, *Assistant Professorial Lecturer in Art*
B.F.A. 1973, Pratt Institute

Shelley Ellen Smith Mastran, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1966, Vassar College; M.A. 1974, George Washington University

Anthony James Mastro, *Professor of Accounting*
B.S. 1951, M.B.A. 1953, New York University; M.A. 1963, University of Notre Dame; C.P.A. 1955, State of New Jersey

Leonard C. Maximon, *Adjunct Professor of Physics*
B.A. 1947, Oberlin College; Ph.D. 1952, Cornell University

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. 1965, Trinity University; Ph.D. 1960, Vanderbilt University

Amy Jo Mazur, *Assistant Professor of Special Education*
B.A. 1971, M.A. 1974, Ed.D. 1977, George Washington University

*Guido Ettore Mazzeo, *Professor of Romance Languages*
B.A. 1936, City University of New York, City College; M.A. 1936, Ph.D. 1961, Columbia University

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* On sabbatical leave spring semester 1984.

David McAleavey, *Associate Professor of English*
B.A. 1966, M.F.A. 1972, Ph.D. 1975, Cornell University

John Francis McCarthy, Jr., *Associate Professor of Business Administration*
B.A. 1936, Duquesne University; M.L. 1955, University of Pittsburgh

Cynthia McClintock, *Associate Professor of Political Science*
B.A. 1967, Harvard University; M.A. 1968, University of California, Los Angeles; Ph.D. 1976, Massachusetts Institute of Technology

John Patrick McGill, *Associate Professorial Lecturer in Journalism*
B.S. 1967, Georgetown University

Dorn Charles McGrath, Jr., *Professor of Urban and Regional Planning*
B.A. 1952, Dartmouth College; M.C.P. 1959, Harvard University

Cornelius Patrick McKelvey, *Assistant Professor of Health Services Administration*
B.S. 1963, Philadelphia College of Pharmacy and Science; M.S. 1970, University of Maryland; M.A. in H.C.A. 1973, George Washington University

Barbara Ann McKinney, *Lecturer in Business Administration*
B.S. in Comm. 1972, University of Louisville; J.D. 1979, George Washington University

Marian McNabb, *Studio Instructor in Piano*
Mus.B. 1930, University of Kansas; M.S. in Mus. 1949, Union Theological Seminary

Cornelius Glen McWright, *Adjunct Professor of Forensic Sciences and of Biological Sciences*
B.A. 1952, University of Evansville; M.S. 1965, Ph.D. 1970, George Washington University

Arthur Charles Meiners, Jr., *Associate Professorial Lecturer in Business Administration*
B.S. in B.A. 1956, Rockhurst College; M.B.A. 1964, University of Michigan; D.B.A. 1974, George Washington University

John Latane Melnick, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1966, J.D. 1981, University of Virginia

Christine Foster Meloni, *Adjunct Instructor in English*
B.A. 1963, Wells College; M.A. 1964, Middlebury College; D.Lettere 1975, University of Rome; M.S. 1981, American University

Kenneth Everett Melson, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1970, Denison University; J.D. 1973, George Washington University

Malcolm Lee Meltzer, *Professor of Psychology*
B.A. 1951, Western Maryland College; M.A. 1954, Ph.D. 1957, Catholic University of America

James W. Mercer, *Associate Professorial Lecturer in Geology*
B.S. 1969, Florida State University; M.S. 1971, Ph.D. 1973, University of Illinois

Henry Merchant, *Associate Professor of Biology*
B.S. 1964, M.S. 1966, University of Maryland; Ph.D. 1970, Rutgers—The State University

Bernard Matthew Mergen, *Professor of American Civilization*
B.A. 1959, University of Nevada; M.A. 1960, Ph.D. 1966, University of Pennsylvania

Astrid Elizabeth Merget, *Associate Professor of Public Administration*
B.A. 1967, Mount Holyoke College; M.P.A. 1968, Ph.D. 1973, Syracuse University

Carl Ronald Merril, *Adjunct Professor of Genetics and Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

Nancy Warren Merritt, *Assistant Professorial Lecturer in Art*
B.F.A. 1973, University of Georgia; M.F.A. 1980, George Washington University

David Metz, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1968, City University of New York, Queens College; M.P.A. 1972, New York University

Michael Ray Metzger, *Assistant Professor of Economics*
B.S. 1972, M.A. 1973, University of Oklahoma; Ph.D. 1979, Stanford University

H. Emerson Meyers, *Professorial Lecturer in Music*

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmental Health*
B.A. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S. in Hygiene and Tropical Medicine 1952, Harvard University

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1946, George Washington University

James Miller, *Professor of Psychology*
B.A. 1958, J.D. 1962, Ph.D. 1966, Yale University

John Houston Miller, *Assistant Professor of Chemistry*
B.A. 1976, Oberlin College; Ph.D. 1980, University of Virginia

Lenore Donna Miller, *Curator, Dimock Gallery*
B.A. 1969, Goucher College; M.F.A. 1972, George Washington University

Lillian Miller, *Professorial Lecturer in Art and American Civilization*
B.A. 1943, Radcliffe College; M.A. 1948, Ph.D. 1962, Columbia University

Mary Fetler Miller, *Assistant Professor of Russian*
B.A. 1943, Northwestern University; M.A. 1966, University of Michigan

Nancy J. Miller, *Clinical Instructor in Art Therapy*
B.S. 1958, University of Missouri; M.A. 1978, George Washington University

Elizabeth A. Milor, *Visiting Assistant Professor of Economics*
B.A. 1977, University of Maryland

Samuel Burdick Molina, *Assistant Professor of Art*
B.A. 1964, M.A. 1969, University of Wyoming

Clarence Cowan Mondale, *Professor of American Civilization*
B.A. 1947, Macalester College; M.A. 1954, Ph.D. 1960, University of Minnesota

Akbar Montaser, *Associate Professor of Chemistry*
B.S. 1969, Pahlavi University, Iran; Ph.D. 1974, Michigan State University

Karen Montgomery, *Assistant Professorial Lecturer in Art*
B.S. 1967, University of Maryland; M.F.A. 1978, George Washington University

Terry William Moody, *Associate Professor of Biochemistry*
B.S. 1972, California Institute of Technology; Ph.D. 1976, University of California, Berkeley

Dorothy Jones Moon, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1973, Marymount Manhattan College; M.S. 1975, City University of New York, Hunter College

Dorothy Adele Moore, *Professor of Education*
B.A. 1954, University of Maryland; M.A. 1959, A.P.C. 1964, Ed.D. 1970, American University

Edward Hampton Moore, *Associate Professorial Lecturer in Journalism*
B.A. 1975, M.A. 1979, Glassboro State College

Michael John Moran, *Assistant Professorial Lecturer in Business Administration*
B.S. 1975, University of Bridgeport; Ph.D. 1980, Pennsylvania State University

Jonathan David Moreno, *Assistant Professor of Philosophy*
B.A. 1973, Hofstra University; Ph.D. 1977, Washington University

John Andrew Morgan, Jr., *Professor of Political Science and Public Affairs*
B.A. 1957, Stetson University; M.A. 1959, Ph.D. 1963, Duke University

Malcolm Harold Morrison, *Associate Professorial Lecturer in Gerontology*
B.S. 1965, McGill University; M.A. 1967, Boston University; M.P.A. 1968, University of Michigan; Ph.D. 1974, Brandeis University

James Norman Mosél, *Professor of Psychology*
B.A. 1940, Colgate University; M.A. 1941, Columbia University

Charles Arthur Moser, *Professor of Slavic*
B.A. 1956, Yale University; M.A. 1956, Ph.D. 1962, Columbia University

Yael M. Moses, *Assistant Professorial Lecturer in Hebrew*
B.S. 1965, Temple University; M.S. 1975, Towson State University

James L. Mudd, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1973, University of Kentucky; M.S. 1979, George Washington University

Ronald Raymond Mueller, *Associate Professorial Lecturer in Journalism*
B.S. 1960, U.S. Naval Academy

Robert Phillip Multhauf, *Adjunct Professor of History*
B.S. 1941, Iowa State University of Science and Technology; M.A. 1950, Ph.D. 1959, University of California, Berkeley

Joseph Patrick Murphy, *Professorial Lecturer in Business Administration*
B.A. 1949, LL.B. 1960, LL.M. 1962, George Washington University

Sharon Lee Murray, *Assistant Professor of Child Health and Development and of Speech-Language Pathology*
B.A. 1963, University of Oregon; M.A. 1969, University of Kentucky; Ph.D. 1972, University of Kansas

Leonard Nadler, *Professor of Education*
B.B.A. 1948, M.S. 1950, City University of New York, City College; Ed.D. 1962, Columbia University

William Guy Nash, *Adjunct Associate Professor of Genetics*
B.S. 1963, M.A. 1965, University of Michigan

Honey Nashman, *Assistant Professor of Human Kinetics and Leisure Studies*
B.S. 1956, New York University; M.S. 1957, Smith College

Nadine Nadeshda Natov, *Professor of Russian*
M.A. 1939, Ph.D. 1941, Pedagogical Institute of Modern Languages, Soviet Union; Ph.D. 1969, University of Michigan

Henry Richard Nau, *Associate Professor of Political Science and International Affairs*
B.S. 1963, Massachusetts Institute of Technology; M.A. 1967, Ph.D. 1972, Johns Hopkins University

Anna Louise Kasten Nelson, *Associate Professorial Lecturer in History*
B.A. 1954, M.A. 1956, University of Oklahoma; Ph.D. 1972, George Washington University

David Nelson, *Professor of Mathematics*
B.A. 1939, M.A. 1940, Ph.D. 1946, University of Wisconsin

Kathryn Newcomer, *Associate Professor of Public Administration*
B.S. 1971, M.A. 1974, University of Kansas; Ph.D. 1978, University of Iowa

Benjamin Nimer, *Professor of Political Science and International Affairs*
B.A. 1942, Ph.D. 1953, University of Chicago

Philip D. Noguchi, *Adjunct Associate Professor of Genetics*
B.A. 1970, University of California, Berkeley; M.D. 1974, George Washington University

Mary Elizabeth Norton, *Associate Professorial Lecturer in Classics*
B.A. 1935, M.A. 1936, University of Michigan

Harriet Novakovich, *Assistant Professorial Lecturer in Special Education*
B.S. 1957, M.S. 1958, Southern Illinois University

Stephen O'Brien, *Adjunct Professor of Genetics*
B.S. 1966, St. Francis College; Ph.D. 1971, Cornell University

Thomas O'Connor, *Professorial Lecturer in Management Science*
B.S. 1947, U.S. Naval Academy; M.B.A. 1956, Harvard University; Ph.D. 1965, Stanford University

Robert Stewart Odmark, *Studio Instructor in French Horn*
B.M. 1969, University of Michigan; M.M. 1972, Catholic University of America

Lynn R. Offermann, *Assistant Professor of Psychology*
B.A. 1975, State University of New York College at Oswego; M.A. 1978, Ph.D. 1981, Syracuse University

George Andrew Olkhovsky, *Associate Professor of Russian*
B.A. 1956, M.A. 1957, University of Minnesota; Ph.D. 1968, Georgetown University

Charles O'Rear, *Professor of Forensic Sciences*
B.S. 1957, Virginia Polytechnic Institute and State University; M.S. 1961, M.C. 1964, University of Richmond; Ph.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Jan Marc Orenstein, *Associate Professor of Pathology*
B.A. 1963, Johns Hopkins University; Ph.D. 1969, M.D. 1971, State University of New York Downstate Medical Center

John Edward Ott, *Professor of Health Care Sciences, of Child Health and Development, and of Health Services Administration*
B.S. 1959, M.D. 1963, University of Pittsburgh

Türker Ozdogan, *Associate Professor of Ceramics*
Diploma 1967, School of Applied Fine Arts, Turkey; M.F.A. 1972, George Washington University

Harry P. Pachon, *Associate Professorial Lecturer in Public Administration*
B.A. 1967, M.A. 1968, California State University, Los Angeles; Ph.D. 1974, Claremont Graduate School

Randall Kent Packer, *Professor of Biology*
B.S. 1967, Lock Haven State College; Ph.D. 1971, Pennsylvania State University

*Chei-Min Paik, *Professor of Accounting and Quantitative Methods*
B.B.A. 1957, University of Minnesota; M.B.A. 1959, University of California, Los Angeles; D.B.A. 1963, Harvard University

Robert John Pallansch, *Studio Instructor in Tuba*

Phyllis Marynick Palmer, *Assistant Professor of Women's Studies and of American Civilization*
B.A. 1966, Oberlin College; M.A. 1967, Ph.D. 1973, Ohio State University

John Paradiso, *Assistant Professorial Lecturer in Art*
B.A. 1971, Manhattan College; B.F.A. 1978, M.F.A. 1982, George Washington University

Salvatore Rocco Paratore, *Professor of Education; Associate Dean of the Division of Continuing Education and Summer Sessions*
B.A. 1957, Colgate University; M.S. 1967, Yeshiva University; Ph.D. 1973, Syracuse University

Richard Roland Pariseau, *Assistant Professorial Lecturer in Business Administration*
B.S. 1960, U.S. Naval Academy; M.S. 1970, Naval Postgraduate School; D.B.A. 1981, George Washington University

Yoon Shik Park, *Professor of Business Administration*
B.A. 1964, Kyung Hee University, Korea; M.B.A. 1967, Fairleigh Dickinson University; D.B.A. 1970, Harvard University; M.A. 1973, Ph.D. 1976, George Washington University

William Carleton Parke, *Associate Professor of Physics*
B.S. 1963, Ph.D. 1967, George Washington University

Ronald H. Parker, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1972, Kent State University; M.S. 1975, American University; Ed.D. 1979, University of Southern California

William Axel Parker, *Associate Professorial Lecturer in Health Services Administration*
B.S. 1945, University of Illinois; M.P.H. 1950, University of California, Berkeley; M.B.A. 1962, George Washington University

Richard Parnas, *Studio Instructor in Violin and Viola*

Robert Parris, *Professor of Music*
B.S. in Mus.Ed. 1945, M.S. in Mus.Ed. 1946, University of Pennsylvania; B.S. in Mus.Comp. 1948, Juilliard School of Music

Gail Paster, *Associate Professor of English*
B.A. 1969, Smith College; M.Phil. 1970, Ph.D. 1972, Yale University

Donald Clark Paup, *Professor of Human Kinetics and Leisure Studies*
B.A. 1961, Occidental College; M.S. 1969, Ph.D. 1970, Tulane University

Leonard Gregory Pawlson, *Associate Professor of Health Care Sciences, of Medicine, and of Health Services Administration*
B.S. 1965, Pennsylvania State University; M.D. 1969, University of Pittsburgh

Eldor Olin Pederson, *Associate Professor of Geography and Regional Science*
B.A. 1966, University of Washington; C.Ph. 1969, Ph.D. 1974, University of California, Berkeley

Joseph Pelzman, *Associate Professor of Economics*
B.S. 1971, Ph.D. 1976, Boston College

Thomas Paul Perazzoli, *Studio Instructor in Flute*

Malinee Peris, *Studio Instructor in Piano*
Licentiate 1946, 1947, Trinity College of Music, London; Licentiate 1950, Royal Academy of Music

Theodore Peter Perros, *Professor of Chemistry and of Forensic Sciences*
B.S. 1946, M.S. 1949, Ph.D. 1952, George Washington University

David Andreas Peterson, *Professorial Lecturer in Business Administration*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University

Ruth Irene Peterson, *Professor of Education*
B.S. 1945, State University of New York at Buffalo; M.S. 1946, Syracuse University; Ph.D. 1971, American University

---

* On sabbatical leave fall semester 1983.

John Charles Petricciani, *Adjunct Professor of Genetics and Professorial Lecturer in Biological Sciences*
B.S. 1956, Rensselaer Polytechnic Institute; M.S. 1960, University of Nevada, Reno; M.D. 1967, Stanford University

Vladimir Petrov, *Professor of International Affairs*
M.A. 1961, Ph.D. 1966, Yale University

Kenna Dale Peusner, *Assistant Professor of Anatomy*
B.S. 1968, Simmons College; Ph.D. 1974, Harvard University

J. Roger Peverley, *Assistant Professor of Physics*
B.A. 1960, M.A. 1964, Ph.D. 1964, Cambridge University

Paul S. Peyser, *Assistant Professor of Business Administration*
B.A. 1966, State University of New York at Binghamton; M.A. 1970, Ph.D. 1979, University of Wisconsin

Marianne Ruth Phelps, *Assistant Professorial Lecturer in Education; Assistant Provost for Affirmative Action*
B.A. 1961, University of Michigan; M.S. 1964, M.A. 1965, University of Wisconsin; M.Phil 1973, Ph.D. 1980, George Washington University

Ewing Lakin Phillips, *Professor of Psychology*
B.S. 1937, Central Missouri State College; M.A. 1940, University of Missouri; Ph.D. 1949, University of Minnesota

Richard L. Phipps, *Assistant Professorial Lecturer in Biological Sciences*
B.S. 1958, Eastern Illinois University; M.S. 1960, Ph.D. 1965, Ohio State University

Dante James Picciano, *Adjunct Associate Professor of Genetics and Associate Professorial Lecturer in Biological Sciences*
B.S. 1966, M.S. 1969, Ph.D. 1973, George Washington University

Catherine Jones Pickar, *Assistant Professor of Music*
B.Mus. 1974, University of Kentucky; M.Mus. 1980, George Washington University

Jerome P. Pickard, *Professorial Lecturer in Geography and Regional Science*
B.A. 1947, M.S. 1949, University of Wisconsin; Ph.D. 1954, Syracuse University

Jack Warren Pierce, *Adjunct Professor of Geology*
B.S. 1949, M.S. 1950, University of Illinois; Ph.D. 1964, University of Kansas

Alfredo Guido Pieruccini, *Associate Professorial Lecturer in Business Administration*
B.G.E. 1956, University of Omaha; M.B.A. 1963, Lehigh University; D.B.A. 1974, George Washington University

Brenda Pillors, *Assistant Professorial Lecturer in Women's Studies*
B.A. 1973, M.Crim. 1974, D.Crim. 1982, University of California, Berkeley

Bernard Thomas Pitsvada, *Professorial Lecturer in Public Administration*
B.S. 1955, M.B.A. 1963, Temple University; Ph.D. 1972, American University

Judith Ann Abrams Plotz, *Associate Professor of English*
B.A. 1960, Radcliffe College; B.A. 1962, M.A. 1966, Cambridge University; Ph.D. 1965, Harvard University

Nancy Polikoff, *Assistant Professorial Lecturer in Women's Studies*
B.A. 1972, University of Pennsylvania; J.D. 1975, Georgetown University; M.A. in Sp.Std. 1980, George Washington University

Herman Pollack, *Research Professor of International Affairs*
B.S. 1940, City University of New York, City College; M.A.I.A. 1966, George Washington University

Francis M. Ponti, *Professorial Lecturer in Statistics*
B.S. 1961, M.B.A. 1963, Drexel University

Paul John Poppen, *Associate Professor of Psychology*
B.A. 1969, Central University of Iowa; Ph.D. 1973, Cornell University

Ben Posner, *Professorial Lecturer in Public Administration*
B.S. in B.A. 1936, University of Arizona; M.A. in Govt. 1941, George Washington University; Ph.D. 1962, American University

Gail Judith Povar, *Assistant Professor of Health Care Sciences and of Medicine*
B.A. 1972, Cornell University; M.P.H. 1977, University of Michigan; M.D. 1977, University of Vermont

Claire Jean Prager, *Visiting Assistant Professor of Business Administration*
B.A. 1963, University of Maryland; M.S. 1964, New York University

*Francisco Prats, *Professor of Physics*
Licenciado en Ciencias Fisico 1946, University of Madrid; Ph.D. 1956, University of Maryland

John Lloyd Preston, *Assistant Professorial Lecturer in Urban and Regional Planning*
B.A. 1953, Vanderbilt University; M.A. 1975, University of Maryland

Stephen Henry Prussing, *Studio Instructor in Voice*
B.A. 1945, Occidental College; Postgraduate Diploma 1948, Juilliard School of Music

William A. Pucilowsky, *Assistant Professor of Speech and Drama*
B.S. 1964, Wilkes College; M.F.A. 1972, Boston University

Charles William Puffenbarger, *Professorial Lecturer in Journalism*
B.S. 1951, University of Maryland; M.A. 1964, George Washington University

Eva Maria Pulgram, *Assistant Professorial Lecturer in German*
M.A. 1969, Ph.D. 1976, Vanderbilt University

Ralph Elliott Purcell, *Professor of Political Science*
B.A. 1940, Florida Southern College; M.A. 1941, Duke University; Ph.D. 1949, University of Wisconsin

Jon Alrik Quitslund, *Associate Professor of English*
B.A. 1961, Reed College; Ph.D. 1967, Princeton University

Sonya Antoinette Quitslund, *Assistant Professor of Religion*
B.A. 1958, Seattle University; M.A. 1964, Ph.D. 1967, Catholic University of America

David Ramaker, *Professor of Chemistry*
B.S. 1965, University of Wisconsin—Milwaukee; M.S. 1968, Ph.D. 1971, University of Iowa

Julie Cathryn Ramsay, *Clinical Instructor in Art Therapy*
B.S. 1960, University of Wisconsin; M.A. 1973, George Washington University

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

Martha Norman Rashid, *Professor of Education*
Ed.B. 1949, State University of New York College at Geneseo; M.A. 1951, Ph.D. 1955, University of Iowa

Roger Neil Rasnake, *Lecturer in Anthropology*
B.A. 1972, George Washington University; M.A. 1977, Cornell University

Patricia Ann Ravenscroft, *Adjunct Assistant Professor of Art Therapy*
B.A. 1972, Duke University; M.A. 1974, George Washington University

George Walter Recker, *Studio Instructor in Trumpet*

John Palmer Reesing, Jr., *Professor of English*
B.A. 1941, Baylor University; M.A. 1942, Tulane University; Ph.D. 1954, Harvard University

*Philip Norman Reeves, *Professor of Health Services Administration*
M.B.A. 1959, University of Chicago; D.B.A. 1970, George Washington University

Martin A. Regalia, *Assistant Professorial Lecturer in Business Administration*
B.A. 1972, University of Santa Clara; M.S. 1976, Ph.D. 1978, University of Wisconsin

Christopher M. Register, *Assistant Professorial Lecturer in Art*
B.F.A. 1979, M.F.A. 1982, George Washington University

Joan Roddy Regnell, *Associate Professor of Speech*
B.A. 1954, M.A. 1960, George Washington University

Bernard Reich, *Professor of Political Science and International Affairs*
B.A. 1961, City University of New York, City College; M.A. 1963, Ph.D. 1964, University of Virginia

Melvin Reich, *Professor of Microbiology*
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers—The State University

Frances Catherine Reid, *Adjunct Assistant Professor of English*
B.A. 1965, College of Notre Dame of Maryland; M.S. 1970, Georgetown University

Mildred Myers Reynolds, *Associate Professorial Lecturer in Health Services Administration*
B.S. 1952, Indiana Central University; M.S. 1955, Butler University; M.S.W. 1969, Catholic University of America; Ed.D. 1978, George Washington University

---

* On sabbatical leave spring semester 1984.

William Martin Reynolds, *Professor of Speech*
B.A. 1950, Wichita State University; M.A. 1957, Ph.D. 1960, University of Florida

Stephen Anthony Rhoades, *Associate Professorial Lecturer in Economics*
B.A. 1965, M.A. 1967, American University; Ph.D. 1971, University of Maryland

Leo Paul Ribuffo, *Associate Professor of History*
B.A. 1966, Rutgers—The State University; M Phil. 1969, Ph.D. 1976, Yale University

Charles Edward Rice, *Professor of Psychology; Assistant Dean of the Graduate School of Arts and Sciences*
B.S. 1954, Iowa State University of Science and Technology; Ph.D. 1959, Case Western Reserve University

Curtis William Richards, *Associate Professorial Lecturer in Business Administration*
B.S. 1960, M.S. 1961, Ph.D. 1977, University of Wisconsin

Ray Charles Rist, *Adjunct Professor of Education*
B.A. 1967, Valparaiso University; M.A. 1968, Ph.D. 1970, Washington University

Delores G. Rivkind, *Lecturer in Human Kinetics and Leisure Studies*

James Willis Robb, *Professor of Romance Languages*
B.A. 1939, Colgate University; M.A. 1950, Middlebury College; Ph.D. 1958, Catholic University of America

Philip Robbins, *Associate Professor of Journalism*
B.A. 1952, Washington and Lee University; M.S. 1955, Columbia University

Richard Mark Robin, *Visiting Assistant Professor of Russian*
B.S. 1972, Georgetown University; M.A. 1974, Ph.D. 1982, University of Michigan

Lilien Filipovitch Robinson, *Professor of Art*
B.A. 1962, M.A. 1965, George Washington University; Ph.D. 1978, Johns Hopkins University

Richard Rodriguez, *Assistant Professorial Lecturer in Art*
B.A. 1972, University of Virginia; M.F.A. 1981, George Washington University

Elie Rogers, *Associate Professorial Lecturer in Journalism*
B.A. 1955, University of Colorado

Daniel David Roman, *Professor of Management Science*
B.S. in B.A. 1949, M.A. 1953, Ph.D. 1956, University of Southern California

Ann Romines, *Assistant Professor of English*
B.A. 1964, Central Methodist College; M.A. 1968, Tufts University; Ph.D. 1977, George Washington University

Frank J. Rooney, *Assistant Professor of Accounting*
B.A. 1970, Loyola College; B.A. 1971, George Mason University; J.D. 1974, George Washington University; LL.M. 1978, Georgetown University

David Ralph Rorick, *Studio Instructor in Trumpet*
B.F.A. 1973, M.F.A. 1976, Carnegie-Mellon University; D.M.A. 1979, Catholic University of America

Carolyn Rusch Rose, *Adjunct Assistant Professor of Art and Anthropology*
B.A. 1971, Sweet Briar College; M.A. 1976, George Washington University

Jeffrey Mark Rosenstein, *Assistant Professor of Anatomy*
B.A. 1971, Kent State University; Ph.D. 1976, Pennsylvania State University

Jean Sylvia Rosenthal, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1980, George Washington University

Lawrence Allen Rothblat, *Professor of Psychology*
B.A. 1964, M.A. 1967, Ph.D. 1968, University of Connecticut

Constance Foshay Row, *Lecturer in Health Services Administration*
B.A. 1963, Barnard College; M.P.A. 1964, Syracuse University

Walter Frederick Rowe, *Associate Professor of Forensic Sciences*
B.S. 1967, Emory University; M.A. 1968, Ph.D. 1975, Harvard University

William Woodin Rowe, *Research Professor of Russian*
B.A. 1958, Harvard University; Ph.D. 1968, New York University

David Alton Rowley, *Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.S. 1963, M.S. 1964, State University of New York at Albany; Ph.D. 1968, University of Illinois

George F. Russell, *Assistant Professorial Lecturer in Museum Studies*
B.S. 1974, University of Maryland

Robert Clinton Rutledge, *Associate Professor of English; Associate Dean of Columbian College of Arts and Sciences*
B.A. 1940, University of Virginia; M.A. 1957, Ph.D. 1966, George Washington University

John L. Ryan, *Adjunct Associate Professor of Health Services Administration*
B.A. 1953, Regis College; M.H.A. 1955, St. Louis University

Robert Warren Rycroft, *Assistant Professor of Public Affairs and Political Science*
B.A. 1967, M.A. 1972, Ph.D. 1976, University of Oklahoma

Raymond Theodore Rye II, *Lecturer in Geology*
B.S. 1955, Iowa State University; M.S. 1971, George Washington University

Bradley William Sabelli, *Assistant Professor of Speech and Drama*
B.F.A. 1970, Florida Atlantic University; M.A. 1972, California State University, Humboldt; M.F.A. 1974, George Washington University

*Howard Morley Sachar, *Professor of History*
B.A. 1947, Swarthmore College; M.A. 1950, Ph.D. 1953, Harvard University

James Minor Sachlis, *Associate Professor of Business Administration*
B.S. 1964, M.B.A. 1966, D.B.A. 1975, University of Maryland

*Pilar G. Suelto de Sáenz, *Associate Professor of Spanish*
Licenciada 1953, University of Madrid; M.A. 1957, Bryn Mawr College; Ph.D. 1966, University of Maryland

George Max Saiger, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1963, Harvard University; M.D. 1967, Albert Einstein College of Medicine

Michael Edwin Samuels, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1964, Guilford College; M.A. 1972, George Washington University; Dr.P.H. 1976, University of North Carolina

†Burton Malcolm Sapin, *Professor of International Affairs and Political Science*
B.A. 1945, M.A. 1947, Columbia University; Ph.D. 1953, Princeton University

M.V. Rama Sastry, *Associate Professorial Lecturer in Economics*
B.A. 1955, Andhra University, India; M.A. 1957, Gujarat University, India; Ph.D. 1965, Iowa State University

Christina Emily Scala, *Assistant Professor of Speech-Language Pathology*
B.A. 1964, M.Ed. 1966, American University

William J. Scanlon, *Associate Professorial Lecturer in Economics*
B.A. 1966, University of Notre Dame; M.A. 1969, Ph.D. 1980, University of Wisconsin

Judy D'Amico Schafer, *Assistant Professorial Lecturer in Speech and Drama*
B.A. 1972, M.S. 1973, Loyola College

Moses S. Schanfield, *Adjunct Associate Professor of Genetics*
B.A. 1966, University of Minnesota; M.A. 1969, Harvard University; Ph.D. 1971, University of Michigan

Rosalyn Schanzer, *Assistant Professorial Lecturer in Art*
B.F.A. 1964, B.S. in Ed. 1964, University of Cincinnati

Stefan Otto Schiff, *Professor of Zoology*
B.S. 1952, Roanoke College; Ph.D. 1964, University of Tennessee, Knoxville

‡Richard Harold Schlagel, *Professor of Philosophy*
B.S. 1949, Springfield College; M.A. 1952, Ph.D. 1955, Boston University

Jeffrey Schlom, *Adjunct Professor of Genetics*
B.S. 1963, Ohio State University; M.S. 1966, Adelphi University; Ph.D. 1969, Rutgers—The State University

Marilyn Strauss Schmal, *Clinical Instructor in Art Therapy*
B.A. 1969, M.A. 1974, George Washington University

Frank Schmidt, *Research Professor of Psychology*
B.A. 1966, Bellarmine College; M.S. 1968, Ph.D. 1970, Purdue University

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* On sabbatical leave fall semester 1983.
† On sabbatical leave academic year 1983-84.
‡ On sabbatical leave spring semester 1984.

William Edward Schmidt, *Professor of Chemistry*
B.S. 1943, M.S. 1950, George Washington University; M.A., Ph.D. 1953, Princeton University

Nancy J. Schoebel, *Clinical Instructor in Art Therapy*
B.A. 1974, Tusculum College; M.A. 1979, George Washington University

Henry Frederick Schuelke III, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1964, Saint Peter's College; J.D. 1967, Villanova University

Richard Scott Schulof, *Assistant Professor of Medicine and of Biochemistry*
B.A. 1968, Cornell University; M.D., Ph.D. 1975, Yeshiva University

Arnold Melvin Schwartz, *Assistant Professor of Pathology*
B.A. 1967, City University of New York, Queens College; Ph.D. 1973, Massachusetts Institute of Technology; M.D. 1978, University of Miami

Peter K. Schwarz, *Lecturer in German*
M.A. 1976, University of Richmond; M.A. 1979, University of Maryland

Robert Lee Schweitzer, *Associate Professorial Lecturer in Business Administration*
B.S. 1971, Towson State University; M.A. 1973, University of Delaware; Ph.D. 1975, Duke University

Lois Green Schwoerer, *Professor of History*
B.A. 1949, Smith College; M.A. 1952, Ph.D. 1956, Bryn Mawr College

*Ormond Albert Seavey, *Assistant Professor of English*
B.A. 1966, Carleton College; M.A. 1967, Ph.D. 1976, Columbia University

Steven A. Seelig, *Professorial Lecturer in Business Administration*
B.A. 1966, Ph.D. 1971, Clark University; M.A. 1968, Washington University

Frank William Segel, *Professorial Lecturer in Accounting*
B.S. 1959, Johns Hopkins University; M.B.A. 1964, M.Phil. 1971, Ph.D. 1972, George Washington University

Barbara Rae Seidman, *Studio Instructor in Harp*
Mus.B. 1969, Cleveland Institute of Music; Mus.M. 1970, Northwestern University

David D. Selden, *Lecturer in Geography*
B.A. 1977, Clark University; M.S. 1979, University of Wisconsin

Ruth O. Selig, *Assistant Professorial Lecturer in Anthropology*
B.A. 1964, Wellesley College; M.A.T. 1966, Harvard University; M.A. 1975, George Washington University

Anastasia Seremetis, *Assistant Professorial Lecturer in Art*
B.A. 1973, M.F.A. 1975, George Washington University

Elwood Lewis Shafer, Jr., *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1956, M.F. 1957, Pennsylvania State University; Ph.D. 1966, State University of New York, College of Environmental Science and Forestry

Stanley Shaloff, *Professorial Lecturer in History*
B.A. 1960, City University of New York, City College; M.A. 1962, Ph.D. 1967, Northwestern University

Muhammed Tariq Shams, *Associate Professorial Lecturer in Physics*
B.S. 1973, Ph.D. 1978, George Washington University

Michael S. Shapiro, *Assistant Professor of Museum Studies and of American Civilization*
B.A. 1970, Syracuse University; M.A. 1974, Ph.D. 1980, Brown University

Jacqueline Elizabeth Sharkey, *Associate Professorial Lecturer in Journalism*
B.A. 1972, M.A. 1976, University of Arizona

*Robert Poindexter Sharkey, *Professor of Economic History*
B.A. 1948, Princeton University; Ph.D. 1958, Johns Hopkins University

Zalman Arthur Shavell, *Professorial Lecturer in Management Science*
B.Aero.Eng. 1960, Rensselaer Polytechnic Institute; M.B.A., 1962, Ph.D. 1969, University of Maryland

Debra R. Sheldon, *Assistant Professor of Accounting*
B.A. 1969, Northwestern University; M.B.A. 1974, Drexel University; D.B.A. 1981, George Washington University

* On sabbatical leave academic year 1983-84.

Charles C. Shepherd, Jr., *Assistant Professor of Business Administration*
B.S. 1971, University of Texas; J.D. 1973, American University

Stanley Newton Sherman, *Professor of Business Administration*
B.A. 1952, M.B.A. 1960, D.B.A. 1977, University of Maryland

Chung-wen Shih, *Professor of Chinese*
B.A. 1945, St. John's University, China; M.A. 1949, Ph.D. 1955, Duke University

Jay Robert Shotel, *Professor of Special Education*
B.A. 1967, Ed.M. 1970, Ed.D. 1972, Temple University

Robert George Shouldice, *Professor of Health Services Administration*
B.A. 1966, Lycoming College; M.B.A. 1969, D.B.A. 1974, George Washington University

Stefan Shrier, *Associate Professorial Lecturer in Statistics*
B.S. 1964, M.S. 1966, Columbia University; Ph.D. 1977, Brown University

Walter Allen Shropshire, Jr., *Professorial Lecturer in Botany*
B.S. 1954, M.S. 1956, Ph.D. 1958, George Washington University

Martin Sicker, *Professorial Lecturer in Gerontology*
B.A. 1965, Long Island University, C.W. Post College; M.A. 1967, Ph.D. 1972, New School for Social Research

Herschel Sidransky, *Professor of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

Frederic Richard Siegel, *Professor of Geochemistry*
B.A. 1954, Harvard University; M.S. 1956, Ph D. 1961, University of Kansas

Gaston Sigur, *Professor of International Affairs; Director, Institute for Sino-Soviet Studies*
Ph.D. 1957, University of Michigan

David Elliot Silber, *Professor of Psychology*
B.A. 1958, Wayne State University; M.A. 1960, Ohio University; Ph.D. 1965, University of Michigan

Stanley C. Silverberg, *Professorial Lecturer in Business Administration*
B.A. 1952, University of Wisconsin; M.A. 1953, Ph.D. 1959, Yale University

*Suzanne Lee Simons, *Associate Professor of Anthropology*
B.A. 1948, Ohio State University; M.A. 1964, Ph.D. 1969, University of New Mexico

Nozer Darabsha Singpurwalla, *Professor of Operations Research and of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S.(I.E.) 1964, Rutgers—The State University; Ph.D. 1968, New York University

Myrna Carol Sislen, *Studio Instructor in Guitar*
B.A. 1970, American University

Frank James Slaby, *Associate Professor of Anatomy*
B.S. 1965, California Institute of Technology; Ph.D. 1971, University of California, Berkeley

Michelle Lynn Slagle, *Visiting Assistant Professor of Business Administration*
B.B.A. 1970, M.B.A 1973, D.P.A. 1983, George Washington University

Claudia Smigrod, *Assistant Professorial Lecturer in Art*
B.F.A. 1971, Alfred University

Arthur Hall Smith, *Associate Professor of Painting*
B.F.A. 1951, Illinois Wesleyan University; M.F.A. 1979, George Washington University

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

Clarice R. Smith, *Assistant Professorial Lecturer in Art*
B.A. 1970, M.F.A. 1979, George Washington University

Daniel L. Smith, *Associate Professorial Lecturer in Journalism*
B.F.A. 1973, Virginia Commonwealth University

George Wilson Smith, *Professor of Education*
B.A. 1953, Central State College, Ed.M. 1965, Ed.D. 1971, University of Maryland

Joseph Thurston Smith, *Associate Professorial Lecturer in Forensic Sciences*
M.D. 1962, University of Alberta

---

* On sabbatical leave fall semester 1983.

Linda T. Smith, *Assistant Professorial Lecturer in Art*
B.F.A. 1978, Florida International University

Nancy Brown Smith, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1973, University of Maryland, M.F.A. 1975, George Washington University

Paul Albert Smith, *Professorial Lecturer in International Affairs*
B.S.F.S. 1949, Georgetown University; M.P.A. 1957, Harvard University

Steven S. Smith, *Assistant Professor of Political Science*
B.A. 1975, St. Cloud State University; Ph.D. 1980, University of Minnesota

Robert T. Smythe, *Professor of Statistics*
B.A. 1963, Oberlin College, B.A. 1965, Oxford University; Ph.D. 1969, Stanford University

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Jane Roberta Snider, *Visiting Assistant Professor of Special Education*
B.A. in Ed. 1968, M.A. in Ed. 1971, Ed.D. 1978, George Washington University

Jeanne Ellen Snodgrass, *Professor of Human Kinetics and Leisure Studies*
B.A. 1952, Ohio Wesleyan University; M.S. in P.E. 1953, Smith College; Ed.D. 1975, University of North Carolina at Greensboro

Nancy Joan Shore Sobel, *Associate Professor of Special Education*
B.S. 1966, University of Michigan; M.A. in Ed. 1970, George Washington University; Ed.D. 1978, American University

Barbara Sobol, *Clinical Instructor in Art Therapy*
B.A. 1959, Wellesley College; M.A. 1980, George Washington University

Michael Joseph Sodaro, *Assistant Professor of International Affairs and Political Science*
B.A. 1967, Fordham University; M.A. 1970, Johns Hopkins University; Ph.D. 1978, Columbia University

Israel Gregory Sohn, *Adjunct Professor of Geology*
B.S. 1935, City University of New York, City College; M.A. 1938, Columbia University; Ph.D. 1966, Hebrew University, Israel

Elinor Harris Solomon, *Professorial Lecturer in Economics*
B.A. 1944, Mount Holyoke College; M.A. 1945, Ph.D. 1948, Harvard University

Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1950, Ph.D. 1959, New York University

Thomas Songster, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, Doane College; M.A. 1963, Northeast Missouri State University; Ph.D. 1967, University of Utah

Richard M. Fairfax Southby, *Professor of Health Services Administration and of Health Care Sciences*
B.Com. 1955, University of Melbourne; M.P.A. 1957, Cornell University; Ph.D. 1973, Monash University, Australia

Jayne Baker Spain, *Distinguished Visiting Professor of Government and Business Administration*
B.S. 1947, University of California, Berkeley; LL.D. 1969, Edgecliff College; Dr.Pub.Serv. 1970, George Washington University; LL.D. 1970, University of Cincinnati; LL.D. 1972, Dunbarton College of the Holy Cross, D.H.L. 1972, Bryant College of Business Administration; LL.D. 1973, Springfield College; LL.D. 1973, Gallaudet College; D.H.L. 1973, Russell Sage College; D.H.L. 1975, Loyola College; D.H.L. 1978, Westminster College (Pennsylvania)

Jerry Douglas Spencer, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1962, Kansas State University; M.D. 1972, University of Kansas; J.D. 1979, University of San Diego

Paul Eppley Spiegler, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1956, University of Maryland; M.A. 1959, George Washington University

Suzanne Maria Spolarich, *Adjunct Instructor in English*
B.A. 1971, Mount Saint Agnes College; M.A. 1975, Columbia University

Marina Stajic, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1972, University of Novi Sad, Yugoslavia; Ph.D. 1977, University of Maryland

Loretta May Stallings, *Professor of Human Kinetics and Leisure Studies*
B.A. 1947, Stanford University; M.A. 1950, University of the Pacific; Ed.D. 1965, University of Texas

George Stambuk, *Professor of International Affairs*
M.A. 1956, Ph.D. 1961, Indiana University

Ronald W. Stanton, *Assistant Professorial Lecturer in Geology*
B.S. 1973, Waynesburg College; M.S. 1975, West Virginia University

Carol Buchalter Stapp, *Instructor in Education*
B.A. 1967, Tulane University; M.A. 1969, University of Pennsylvania

James Edward Starrs, *Professor of Law and of Forensic Sciences*
B.A., LL.B., 1958, St. John's University, New York; LL.M. 1959, New York University

Carl Steiner, *Professor of German*
B.A. 1958, M.A. 1962, Ph.D. 1966, George Washington University

George Steiner, *Professor of Music*
B.S. 1938, Mus.B. 1938, Mus.M. 1940, Johns Hopkins University

*Christopher Willie Sten, *Associate Professor of English*
B.A. 1966, Carleton College; M.A. 1968, Ph.D. 1971, Indiana University

Jeffrey L. Stephanic, *Assistant Professor of Photography*
B.A. 1977, M.F.A. 1980, George Washington University

George Christopher Stephens, *Associate Professor of Geology*
B.S. 1967, M.S. 1969, George Washington University; Ph.D. 1972, Lehigh University

Richard Walton Stephens, *Professor of Sociology*
B.A. 1951, Franklin and Marshall College; M.A. 1953, Ph.D. 1956, University of North Carolina

Christopher H. Sterling, *Professor of Speech and Drama*
B.S. 1965, M.S. 1967, Ph.D. 1969, University of Wisconsin

*Charles Todd Stewart, Jr., *Professor of Economics*
B.A. 1940, M.A. 1948, Ph.D. 1954, George Washington University

Phyllis Langton Stewart, *Professor of Sociology*
B.A. 1961, M.A. 1962, California State University, Los Angeles; Ph.D. 1968, University of California, Los Angeles

Bradley R. Stevens, *Assistant Professorial Lecturer in Art*
B.F.A. 1976, M.F.A. 1979, George Washington University

Eugene Almon Stone, *Associate Professor of Mathematics*
B.A. 1960, Vanderbilt University; Ph.D. 1966, University of Virginia

James Ashley Straw, *Professor of Pharmacology*
B.S. 1958, Ph.D. 1963, University of Florida

Thomas Edward Sulkowski, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1977, Pennsylvania State University; M.Ed. 1978, University of Virginia

Theodore Suranyi-Unger, Jr., *Professorial Lecturer in Economics*
B.A. 1950, Syracuse University; Dr. rer. pol. 1957, University of Vienna

Esther C. Suss, *Assistant Professorial Lecturer in Economics*
B.S. 1969, M.A. 1971, Ph.D. 1972, University of Pittsburgh

P.A.V.B. Swamy, *Adjunct Professor of Economics*
M.A. 1957, M.S. 1958, Andhra University, India; Ph.D. 1966, University of Wisconsin

Glenn Vincent Swengros, *Lecturer in Human Kinetics and Leisure Studies*
B.S. in Ed. 1958, M.S. in Ed. 1960, University of Kansas

Choy-Tak Taam, *Professor of Mathematics*
B.S. 1942, University of Illinois; M.A. 1943, Ph.D. 1945, Harvard University

James Maxwell Talens, *Assistant Professorial Lecturer in Business Administration*
B.S. in E.E. 1968, University of Pennsylvania; M.B.A. 1972, J.D. 1975, Temple University

Vito Tanzi, *Adjunct Professor of Economics*
B.A. 1951, M.A. 1961, George Washington University; M.A. 1963, Ph.D. 1966, Harvard University

Morton Frank Taragin, *Associate Professor of Physics*
B.S. in Engr. 1965, M.Phil. 1969, Ph.D. 1970, George Washington University

Louise Entzminger Taylor, *Professorial Lecturer in Public Administration*
B.S. 1954, New York University; M.S. 1968, Jersey City State College; Ph.D. 1971, University of Pittsburgh

---

* On sabbatical leave academic year 1983-84.

Thomas Clinton Teeples, *Associate Professorial Lecturer in Statistics*
B.S. 1966, M.S.A. 1971, George Washington University

Geza Teleki, Jr., *Associate Professorial Lecturer in Anthropology*
B.A. 1967, George Washington University; M.A. 1970, Ph.D. 1977, Pennsylvania State University

Douglas Harold Teller, *Professor of Design and Graphics*
B.A. 1956, Western Michigan University; M.F.A. 1962, George Washington University

Peter F. Thall, *Assistant Professor of Statistics*
B.S. 1971, Michigan State University; M.S. 1973, Ph.D. 1975, Florida State University

Jean-François Marie Thibault, *Associate Professor of French*
Baccalaureat 1960, Licence ès Lettres 1964, Diplôme d'Etudes 1965, Academie de Paris; Ph.D. 1976, University of Maryland

Joan Elizabeth Thiel, *Associate Professor of Speech*
B.A. 1961, Marygrove College; M.F.A. 1971, Catholic University of America; Ph.D. 1975, University of Michigan

Klaus Thoenelt, *Professor of German*
Staatsexamen 1956, Ph.D. 1961, University of Freiburg

George Selby Thomas, *Lecturer in Business Administration*
B.S. 1948, U.S. Military Academy; M.S. 1968, Air Force Institute of Technology; M.B.A. 1975, George Washington University

Raymond Edward Thomas, *Associate Professor of Statistics*
B.A. 1955, M.A. 1957, M.Phil. 1971, George Washington University

Irene Thompson, *Associate Professor of Russian*
B.S. 1963, M.S. 1966, Georgetown University

Robert Leslie Thompson, *Professorial Lecturer in Forensic Sciences*
B.S. 1958, Mississippi State University; M.D. 1961, University of Mississippi; M.S. 1974, George Washington University

Shirley E. Thompson, *Adjunct Instructor in English*
B.A. 1970, Kalamazoo College; M.A. 1977, University of Michigan

Sylvia Howe Thompson, *Lecturer in Anthoropology*
B.A. 1976, Smith College

Richard Thornton, *Professor of History and International Affairs*
B.A. 1961, Colgate University; Ph.D. 1966, University of Washington

Samuel Thurm, *Professorial Lecturer in Business Administration*
B.A. 1939, Dartmouth College; M.B.A. 1941, Columbia University

James B. Thurman, *Assistant Professor of Business Administration*
B.A. 1966, M.B.A. 1972, Ph.D. 1978, Pennsylvania State University

Max David Ticktin, *Assistant Professor of Hebrew*
B.A. 1942, University of Pennsylvania; M.H.L. 1947, D.D. 1977, Jewish Theological Seminary of America

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology; Professor of Education*
B.A. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
B.A. 1951, L.H.D. 1976, Mount Holyoke College; M.S. 1955, Ph.D. 1959, University of Wisconsin; Sc.D. 1973, Wilson College; D.Sc. 1974, Trinity College (District of Columbia); HH.D. 1977, St. Mary's College (Indiana); D.Sc. 1977, Cedar Crest College; D.Sc. 1978, The University of the South; D.Sc. 1979, Goucher College; Litt.D. 1980, Regis College; Litt.D. 1980, College of Saint Catherine; HH.D. 1982, Hood College

Neil Avrill Tilkens, *Associate Professor of Music*
Mus.B. 1950, Columbia Union College; Mus.M. 1952, Philadelphia Conservatory of Music

Barbara Mills Timberlake, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1952, George Washington University; M.A. 1955, Amherst College

George Todaro, *Adjunct Professor of Genetics*
B.A. 1958, Swarthmore College; M.D. 1963, New York University

Susan J. Tolchin, *Associate Professor of Public Administration*
B.A. 1961, Bryn Mawr College; M.A. 1962, University of Chicago; Ph.D. 1966, New York University

Margaret Cooper Tolson, *Adjunct Assistant Professor of Music*
Mus.B. 1921, Mus.M. 1936, University of Rochester

Carl Augustus Troester, Jr., *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1937, Northeast Missouri State University; M.A. 1938, University of Missouri; Ed.D. 1942, Columbia University

*Joseph Louis Tropea, *Associate Professor of Sociology*
B.A. 1962, Wayne State University; M.A. 1965, Michigan State University; Ph.D. 1973, George Washington University

Robert P. Trost, *Associate Professor of Economics*
B.M.E. 1969, University of Detroit; Ph.D. 1977, University of Florida

†Lem Hoang Truong, *Associate Professor of Public Administration*
B.S. 1960, National Institute of Administration, Vietnam; M.P.A. 1968, Ph.D. 1971, University of Southern California

Linda Albertson Tsantis, *Associate Professor of Special Education*
B.A. 1965, M.A. 1970, Old Dominion University; Ed.D. 1974, George Washington University

Colin M. Turnbull, *Professor of Anthropology*
B.A. 1947, M.A. 1949, B.Litt. 1957, D.Phil. 1964, Oxford University

Mortimer Darling Turner, *Associate Professorial Lecturer in Geology*
B.S. 1943, M.S. 1954, University of California, Berkeley; Ph.D. 1972, University of Kansas

Curtis Edward Tuthill, *Associate Professor of Psychology*
B.A. 1935, Macalester College; M.A. 1936, Ph.D. 1939, University of Iowa

Alan D. Ullberg, *Adjunct Associate Professor of Art*
B.A. 1954, Reed College; LL.B. 1960, Harvard University

Elinor Ulman, *Adjunct Associate Professor of Art Therapy*
B.A. 1930, Wellesley College; B.S. 1943, Iowa State University of Science and Technology; D.ArtTh. (Hon.) 1981, Norwich University

*Stuart Umpleby, *Associate Professor of Management Science*
B.S., B.A. 1967, M.A. 1969, Ph.D. 1975, University of Illinois

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

Peter B. Vaill, *Professor of Human Systems*
B.A. 1956, University of Minnesota; M.B.A. 1960, D.B.A. 1964, Harvard University

Robin Linda Vann, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1982, George Washington University

Arthur Viterito, *Assistant Professor of Geography and Regional Science*
B.A. 1973, Long Island University; M.A. 1976, State University of New York at Albany; Ph.D. 1980, University of Denver

John Michael Vlach, *Associate Professor of American Civilization and of Anthropology*
B.A. 1970, University of California, Davis; M.A. 1972, Ph.D. 1975, Indiana University

Harvey Joseph Volzer, *Assistant Professorial Lecturer in Forensic Sciences*
B.S.F.S. 1970, Georgetown University; J.D. 1974, Duquesne University; M.A. 1978, Boston University; LL.M. 1980, George Washington University

Barbara Ann Von Barghahn, *Associate Professor of Art*
B.A. 1970, University of Iowa; M.A. 1972, Ph.D. 1979, New York University

David Von Endt, *Associate Professorial Lecturer in Art and Anthropology*
B.A. 1960, Columbia Union College; M.S. 1964, University of Maryland; Ph.D. 1975, Howard University

Clemmont Eyvind Vontress, *Professor of Education*
B.A. 1952, Kentucky State College; M.S. 1956, Ph.D. 1965, Indiana University

Alan G. Wade, *Assistant Professor of Speech*
B.A. 1968, Ph.D. 1981, Northwestern University; M.A. 1972, Catholic University of America

Holliday Bellew Wagner, *Assistant Professor of Biological Sciences; Assistant Director, Division of Experimental Programs*
B.S. 1976, State University of New York Empire State College; Ph.D. 1981, University of Pennsylvania

Richard David Walk, *Professor of Psychology*
B.A. 1943, Princeton University; M.A. 1947, University of Iowa; M.A. 1948, Ph.D. 1951, Harvard University

---

* On sabbatical leave academic year 1983-84.
† On leave of absence fall semester 1983.

Robert Harris Walker, Jr., *Professor of American Civilization*
B.S. 1945, Northwestern University; M.A. 1950, Columbia University; Ph.D. 1955, University of Pennsylvania

*Dewey Diaz Wallace, Jr., *Professor of Religion*
B.A. 1957, Whitworth College; B.D. 1960, Princeton Theological Seminary; M.A. 1962, Ph.D. 1965, Princeton University

Ruth Ann Wallace, *Professor of Sociology*
B.A. 1961, Immaculate Heart College; M.A. 1963, University of Notre Dame; Ph.D. 1968, University of California, Berkeley

Raymond John Walsh, *Associate Professor of Anatomy*
B.S. 1969, University of Massachusetts; Ph.D. 1978, Tufts University

Regis Hills Walther, *Professorial Lecturer in Management Science*
B.A. 1941, University of California, Los Angeles; M.A. 1960, Ph.D. 1963, George Washington University

George Ching Yuan Wang, *Assistant Professor of Chinese*
B.A. 1951, Taiwan Normal University; M.S. 1955, Tokyo University of Education

Ming Wang, *Lecturer in Chinese*

William Arthur Ward, *Professorial Lecturer in Management Science*
B.A. 1961, M.A. 1966, Ph.D. 1970, University of Colorado

Thomas Howard Wardlow, *Studio Instructor in Percussion*
B.S. 1962, M.S. 1964, University of Illinois

Wilcomb Edward Washburn, *Professorial Lecturer in American Civilization*
B.A. 1948, Dartmouth College, Ph.D. 1955, Harvard University

Charles Woodrow Washington, *Associate Professor of Public Administration*
B.A. 1966, M.P.A. 1971, Florida Atlantic University; Ph.D. 1976, Syracuse University

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1963, University of Louisville; Ph.D. 1968, University of Wisconsin

Harry S. Watson, *Assistant Professor of Economics*
B.A. 1971, Ph.D. 1981, Indiana University

Dave Henry Watts, *Professorial Lecturer in Business Administration*
B.B.A. 1968, M.B.A. 1970, D.B.A. 1974, George Washington University

Stephen Jay Wayne, *Professor of Political Science and Public Affairs*
B.A. 1961, University of Rochester; M.A. 1963, Ph.D. 1968, Columbia University

Ann Gordon Webster, *Lecturer in Anthropology*
B.A. 1950, Wellesley College; M.A. 1979, George Washington University

Lawrence Howard Wechsler, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1967, Pennsylvania State University; J.D. 1970, George Washington University

Lee-Jen Wei, *Professor of Statistics*
Ph.D. 1975, University of Wisconsin

Susan B. Welchman, *Associate Professorial Lecturer in Journalism*
B.F.A. 1970, Philadelphia College of Art

Stephen William Wellman, *Studio Instructor in Voice*
Mus.B. 1974, North Carolina School of the Arts

Elizabeth Fortson Wells, *Assistant Professor of Botany*
B.A. 1965, Agnes Scott College; M.A. 1970, Ph.D. 1977, University of North Carolina

Barbara Rosen Wendel, *Assistant Professorial Lecturer in Art*
B.A. 1967, University of Maryland, M.F.A. 1979, University of Delaware

Peter Werres, *Associate Professorial Lecturer in German*
M.Phil. 1972, Ph.D. 1977, George Washington University

Harvey Robert Wertlieb, *Professorial Lecturer in Health Services Administration*
B.A. 1961, M.B.A. 1964, George Washington University

Harry Miles West III, *Professorial Lecturer in Public Administration*
B.A. 1963, University of Maryland; M.S. 1967, D.P.A. 1973, George Washington University

Briggs J. White, *Professorial Lecturer in Forensic Sciences*
B.A. 1932, D.C.L. 1965, Sterling College; M.A. 1936, Ph.D. 1940, University of Colorado

* On sabbatical leave spring semester 1984.

David Gover White, *Professor of Chemistry*
B.Ch.E. 1950, Cornell University; Ph.D. 1954, Harvard University

Jane Elizabeth White, *Adjunct Assistant Professor of Music*
Mus.B. 1950, University of Rochester; M.A. 1963, American University

Richard Otis White, *Studio Instructor in Oboe*
Mus.B. 1950, University of Rochester

John Theodore Wieseman, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1956, Wesleyan University; LL.B. 1963, Columbia University

David Wigdor, *Professorial Lecturer in American Civilization*
Ph.D. 1968, University of Missouri

Garland Dean Wiggs, *Associate Professor of Education*
B.B.A. 1956, University of Cincinnati; M.A. 1960, University of Northern Colorado; Ed.D. 1971, George Washington University

Brien R. Williams, *Assistant Professor of Speech*
B.A. 1963, University of California, Berkeley; M.A. 1972, San Francisco State University; Ph.D. 1978, Northwestern University

Ellen Reeder Williams, *Assistant Professor of Art*
B.A. 1969, Wellesley College; M.A. 1972, Ph.D. 1974, Princeton University

Harriet Moncure Williams, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1975, University of Richmond

Katherine Johnston Williams, *Assistant Professor of Art Therapy*
B.A. 1962, University of Wisconsin; M.A. 1977, George Washington University

Robert Crumpton Willson, *Associate Professor of Journalism*
B.A. 1951, George Washington University

John C. Wilmot, *Adjunct Associate Professor of Health Services Administration*
B.S. 1954, Iowa State University

Lawrence Winkler, *Professor of Education*
B.S. 1952, M.A. 1954, Washington University; Ed.D. 1965, George Washington University

Erik Kenelm Winslow, *Associate Professor of Behavioral Sciences*
B.S. 1963, Pennsylvania State University; M.S. 1965, Ph.D. 1967, Case Western Reserve University

Warren J. Winstead, *Visiting Professor of Government and Business; Executive-in-Residence for Acquisition and Grants Management, School of Government and Business Administration*
B.A. 1950, M.S. 1955, University of Richmond; Ed.D. 1958, Harvard University

Philip Wirtz, *Assistant Professorial Lecturer in Statistics*
B.A. 1971, Ph.D. 1983, George Washington University; M.S. 1974, Purdue University

Maida Rust Withers, *Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1966, Brigham Young University; M.S. 1960, University of Utah

Sharon Lee Wolchik, *Assistant Professor of International Affairs and Political Science*
B.A. 1970, Syracuse University; M.A. 1972, Indiana University; Ph.D. 1978, University of Michigan

Thomas F. Wolfinger, *Lecturer in Mathematics*
B.S. 1974, University of Hartford, M.A. 1976, Dartmouth College; M.S. 1980, University of North Carolina

Jerome Morris Wolgin, *Associate Professorial Lecturer in Economics*
B.A. 1965, University of Pennsylvania; M.Phil. 1969, Ph.D. 1973, Yale University

Kirk Marcus Wolter, *Professorial Lecturer in Statistics*
B.A. 1970, St. Olaf College; M.S. 1972, Ph.D. 1974, Iowa State University

Giles Clement Wooding, *Assistant Professor of Accounting*
B.Comm. 1972, Concordia University, Canada; M.Acc. 1973, Ohio State University

Wendy Woodson, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1980, M.A. 1977, George Washington University

William Thomas Woodward, *Assistant Professor of Painting*
B.A. 1957, M.A. 1961, American University

Gail B. Wright, *Instructor in Accounting*
B.A. 1964, College of William and Mary; M.S. 1978, Virginia Commonwealth University

George Ernest Wright, Jr., *Assistant Professor of Economics*
B.A. 1962, College of Wooster; M.A. 1964, Ph.D. 1977, University of Michigan

John Franklin Wright, Jr., *Professor of Drawing and Graphics*
B.A. 1954, American University; M.A. 1960, University of Illinois

Shirley Minkewitz Wright, *Adjunct Assistant Professor of English*
B.S. 1954, Winona State University; M.A. 1963, University of Michigan; Ph.D. 1971, Georgetown University

Thomas Oscar Wright, *Associate Professorial Lecturer in Geology*
B.S. 1965, Auburn University; M.S. 1971, Ph.D. 1974, George Washington University

William Ralph Wright, *Studio Instructor in Clarinet and Saxophone*
Diploma 1951, Curtis Institute of Music, M.M. 1971, Catholic University of America

Jeremy S. Wu, *Assistant Professorial Lecturer in Statistics*
B.A. 1974, M.A. 1976, Ph.D. 1983, George Washington University

May Yacoob, *Associate Professorial Lecturer in Anthropology*
B.A. 1970, Rutgers The State University, M.A.A. 1976, Ph.D. 1980, Boston University

Harry Elwood Yeide, Jr., *Professor of Religion*
B.A. 1953, Williams College; B.D. 1957, Union Theological Seminary; Ph.D. 1966, Harvard University

Anthony Marvin Yezer, *Associate Professor of Economics*
B.S. 1966, Dartmouth College; M.S. 1967, London School of Economics and Political Science; Ph.D. 1974, Massachusetts Institute of Technology

Colette Marie Yglesias, *Lecturer in Human Kinetics and Leisure Studies*
B.F.A. 1975, The Juilliard School

Richard Yi-chang Yin, *Associate Professor of Economics*
LL.B. 1946, Fu Jen University, China; M.A. 1950, University of Denver; Ph.D. 1966, Columbia University

David Laster Zalkind, *Associate Professor of Health Services Administration*
B.A. 1967, Harvard University; M.S. 1968, Stanford University; Ph.D. 1972, Johns Hopkins University

Meira Ellen Zedek, *Associate Clinical Professor of Psychology*
B.A. 1953, Hebrew University, Israel; M.A. 1954, Ph.D. 1958, Boston University

Beth Mildred Zeidman, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1974, University of Maryland, M.A. in Ed. 1978, George Washington University

Joseph Zeidner, *Research Professor of Public Policy and Behavioral Sciences*
B.S. 1949, City University of New York, City College; M.A. 1951, Fordham University; Ph.D. 1954, Catholic University of America

Janet A. Zilczer, *Visiting Assistant Professor of Geology*
B.A. 1976, M.Phil. 1979, Ph.D. 1981, George Washington University

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychology*
B.A. 1951, M.S.W. 1953, University of California, Berkeley; Ph.D. 1967, Catholic University of America

Jeffrey A. Zinn, *Associate Professorial Lecturer in Geography*
B.A. 1967, University of Vermont; M.A. 1970, University of Rhode Island, Ph.D. 1972, Oregon State University

John Edmund Ziolkowski, *Associate Professor of Classics*
B.A. 1958, Duke University; Ph.D. 1963, University of North Carolina

Bernard Charles Zook, *Associate Professor of Pathology (Comparative)*
B.S. 1962, D.V.M. 1963, Colorado State University

Artley Joseph Zuchelli, *Professor of Physics*
B.A. 1955, Ph.D. 1958, University of Virginia

Evenor Zuniga, *Assistant Professorial Lecturer in Education*
B.A. 1949, Knox College; M.A. 1950, Northwestern University; Ed.D. 1973, George Washington University

CONSULTANTS IN RESEARCH—
GRADUATE SCHOOL OF ARTS AND SCIENCES

Robert S. Adelstein, *Chief, Laboratory on Molecular Cardiology, National Heart, Lung, and Blood Institute;* Biochemistry (Structure and Function of Contractile Proteins)
B.A. 1955, Princeton University; M.D. 1959, Harvard University

James Adkins, *Chief, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration;* Biological Sciences (Nutrient Bioavailability)
B.S. 1953, Virginia State College; M.S. 1958, Ph.D. 1961, University of Wisconsin

Olajide Agbede; Human Ecology (Clinical Microbiology)
B.S. 1971, M.S. 1972, Howard University; Ph.D. 1977, George Washington University

Elizabeth Potts Anderson, *Research Biochemist, Laboratory of Biochemistry, National Cancer Institute;* Metabolism of Purines and Pyrimidines
B.A. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1951, Stanford University

Wayne B. Anderson, *Senior Investigator, Laboratory of Pathophysiology, National Cancer Institute;* Biochemistry (Molecular Biology)
B.S. 1963, M.S. 1965, Ph.D. 1968, University of North Dakota

Aftab Ahmed Ansari, *Head, Cellular Immunology Division, Naval Medical Research Institute, National Naval Medical Center;* Microbiology (Immunology)
B.S. 1961, D.J. Government Science College, Pakistan; M.S. 1963, University of Karachi; M.S. 1967, University of California, Los Angeles; Ph.D. 1970, University of Arizona

Richard Asofsky, *Head, Experimental Pathology Section, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases;* Immunology
M.D. 1958, State University of New York

William Back, *Research Hydrologist, U.S. Geological Survey;* Geology (Hydrogeology)
B.S. 1948, University of Illinois; M.S. 1955, University of California, Berkeley; M.P.A. 1956, Harvard University; Ph.D. 1960, University of Nevada

Jerry Laurens Barnard, *Curator, Division of Crustacea, U.S. National Museum of Natural History, Smithsonian Institution;* Crustacean Biology
B.A. 1949, M.S. 1950, Ph.D. 1963, University of Southern California

Joseph Bellanti, *Professor of Pediatrics and of Microbiology, Georgetown University School of Medicine;* Microbiology (Immunology)
B.S. 1954, M.D. 1958, State University of New York at Buffalo

Larry Bilker, *Chief Psychologist, Bradley Day Hospital, Rhode Island;* Psychology (Family and Child Diagnosis and Therapy)
B.A. 1960, City University of New York, Brooklyn College; M.A. 1966, Ph.D. 1970, University of Florida

Ethel Joan Blanchette-Mackie, *Director, Electron Microscopy Laboratory, Section for Nutrition and Endocrinology, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases;* Biology of Lipids
B.S. 1956, City University of New York, Queens College; M.S. 1959, New York University; Ph.D. 1965, Columbia University

Larry Bockstahler, *Chief, Pathologic Studies Section, Division of Biological Effects, Bureau of Radiological Health, U.S. Food and Drug Administration;* Genetics (Radiation Bio-effects)
B.S. 1956, Michigan State University; M.S. 1961, Ph.D. 1964, University of Wisconsin

Charles Boone, *Head, Cell Biology Section, Viral Biology Branch, National Cancer Institute;* Microbiology (Virology)
M.D. 1951, University of California, San Francisco; Ph.D. 1963, University of California, Los Angeles

Wallace Bowman, *Chief, Environment and Natural Resources Policy Division and Senior Specialist in Environmental Policy, Congressional Research Service, Library of Congress*; American Civilization (Man, Nature and Environment)
B.A. 1949, M.S. 1953, Washington University; M.A. 1956, Yale University

Murray Frederick Brennan, *Head, Surgical Metabolism Section, Surgery Branch, National Cancer Institute*; Biochemistry (Surgical Science)
B.S. 1961, University of New Zealand; M.B.Ch.B. 1964, University of Otago, New Zealand

Milton Brightman, *Head, Section on Neurocytology, Laboratory of Neuropathology and Neuroanatomical Sciences, National Institute of Neurological Diseases*; Anatomy (Neuroanatomy)
B.S. 1945, M.A. 1948, University of Toronto, Canada; Ph.D. 1954, Yale University

Barry L. Brown, *Research Chemist, Federal Bureau of Investigation, U.S. Department of Justice*; Biological Sciences (Testosterone Metabolites)
B.S. 1966, M.S. 1968, University of Georgia; Ph.D. 1972, Purdue University

Stephen Wheeler Burks, *Senior Staff Associate, National League of Cities*; State and Local Politics
B.A. 1962, Stanford University; M.A. 1969, Ph.D. 1972, Michigan State University

Charles Philip Butcher, *Professor of English and Dean of the Graduate School, Morgan State College*; American Civilization (Afro-American Literature and History)
B.A. 1942, M.A. 1947, Howard University; Ph.D. 1956, Columbia University

Cary Carson, *Director of Research, Colonial Williamsburg Foundation*; American Civilization (Vernacular Architecture)
B.A. 1963, Carleton College; M.A. 1965, University of Delaware; Ph.D. 1974, Harvard University

Keven John Catt, *Chief, Reproduction Branch, National Institute of Child Health and Human Development*; Endocrine Pharmacology
B.S. 1956, M.D. 1960, University of Melbourne, Australia; Ph.D. 1967, Monash University, Australia

Kenneth Shueh-Shen Chang, *Head, Viral Oncogenesis Section, Laboratory of Cell Biology, National Cancer Institute*; Microbiology (Virology)
M.D. 1951, National Taiwan University; Doctor of Medical Science 1960, Tokyo University

Michael A. Chirigos, *Associate Branch Chief, Viral Biology Branch, National Cancer Institute*; Immunology
B.S. 1952, Western Maryland College; M.S. 1954, University of Delaware; Ph.D. 1957, Rutgers—The State University

Louis Arthur Cohen, *Chief, Section on Biochemical Mechanisms, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases*; Chemistry (Biochemical Mechanisms)
B.S. 1949, Northwestern University; Ph.D. 1952, Massachusetts Institute of Technology

John Young Cole, Jr., *Executive Director, Center for the Book, Library of Congress*; American Civilization
B.A. 1962, M.L.S. 1963, University of Washington; M.L.A. 1966, Johns Hopkins University; Ph.D. 1971, George Washington University

Bruce Collette, *Assistant Director, Bureau of Commercial Fisheries, Systematics Laboratory, Smithsonian Institution*; Biology of Fishes
B.S. 1956, Ph.D. 1960, Cornell University

Erminio Costa, *Chief, Laboratory of Preclinical Pharmacology, National Institute of Mental Health*; Neuropharmacology
M.D. 1949, Universities of Padua and Cagliari

Richard L. Cysyk, *Head, Drug Metabolism Section, Laboratory of Chemical Pharmacology, National Cancer Institute*; Pharmacology (Drug Metabolism)
B.S. 1965, University of Maryland; Ph.D. 1970, Yale University

Robert Emmett Darcy, *Political Science Department, Oklahoma State University*; Political Science (Politics and Social Change)
B.A. 1965, University of Wisconsin; M.A. 1970, Ph.D. 1971, University of Kentucky

Clyde Dawe, *Head, Comparative Oncology Section, Laboratory of Pathology, National Cancer Institute*; Biological Sciences (Oncology)
B.A. 1942, Lafayette College; M.D. 1945, Johns Hopkins University; Ph.D. 1956, University of Minnesota

John Farrar, *Senior Investigator, National Institute of Dental Research*; Microbiology (Immunology)
B.A. 1966, M.S. 1968, Miami University; Ph.D. 1972, University of Notre Dame

Cynthia R. Field, *Associate Professorial Lecturer in American Civilization*; Architectural History
B.A. 1963, Bryn Mawr College; M.A. 1967, Ph.D. 1974, Columbia University

Mattie Rae Spivey Fox, *Chief, Minerals Section, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration*; Biochemistry (Mineral Nutrition)
B.S. 1943, Texas Women's University; M.S. 1945, Iowa State University; Ph.D. 1953, George Washington University

John Eric Fredland, *Professor of Economics, U.S. Naval Academy*; Public Finance
B.A. 1964, Harvard University; M.A. 1966, Ph.D. 1970, University of Michigan

Ernst Freese, *Chief, Molecular Biology Laboratory, National Institute of Neurological Disorders, Communicable Diseases, and Stroke*: Biochemistry (Mutagens, Control Mechanisms, and Properties of Membranes)
Vordiplom 1948, University of Heidelberg; Diplom 1951, Ph.D. 1953, University of Gottingen

Robert M. Friedman, *Chief, Laboratory of Experimental Pathology, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases*; Experimental Pathology
B.A. 1954, Cornell University; M.D. 1958, New York University

Jerry David Gardner, *Chief, Section of Gastroenterology, Digestive Diseases Branch, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases*; Physiology (Digestive Diseases)
B.A. 1962, University of Kansas; M.D. 1966, University of Pennsylvania

Robert Gibbs, Jr., *Chairman, Department of Vertebrate Zoology National Museum of Natural History, Smithsonian Institution*; Vertebrate Zoology
B.A. 1951, Ph.D. 1955 Cornell University

Joseph Goldstein, *Assistant Professor of Metallurgy, Department of Metallurgy and Material Science, Lehigh University*; Meteorite Study
B.S. 1960, M.S. 1962, D.Sc. 1964, Massachusetts Institute of Technology

Robert Goldstein, *Chief, Pulmonary Immunology Research Laboratory, Veterans Administration Hospital*; Microbiology (Immunology)
B.A. 1962, Brandeis University, M.D. 1966, Jefferson Medical College; Ph.D. 1976, George Washington University

James Granger, *Chief of Child Guidance Service and Director of Training, Walter Reed General Hospital*; Art Therapy
B.A. 1955, University of California, Berkeley; M.D. 1961, University of Rochester

Gordon Guroff, *Head, Section on Intermediary Metabolism, Laboratory of Developmental Neurobiology, National Institute of Child Health and Development*; Amino Acid Metabolism
B.S. 1954, University of Illinois; M.S. 1956, Auburn University; Ph.D. 1959, University of Wisconsin

Frederick Gutheim, *Chairman, Gutheim, Seelig, Erickson, Inc.*; American Civilization (Urban Studies, Historic Preservation)
B.A. 1931, University of Wisconsin

Gordon Hager, *Head, Viral Immunogenetics Section, Tumor Virus Genetics Laboratory, National Cancer Institute*; Viral Immunogenetics
B.S. 1964, University of Kansas; Ph.D. 1970, University of Washington

John Hardt, *Senior Specialist in Soviet Economics, Congressional Research Service, Economic Division, Library of Congress*; Soviet Economics (Comparative Economic Systems)
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Robert Harmon, *Assistant Professor of Psychiatry, University of Colorado*; Child Psychiatry
B.A. 1967, Miami University; M.D. 1971, University of Colorado

Joseph Ernest Hazel, *Research Geologist, Paleontology and Stratigraphy Branch, U.S. Geological Survey*; Paleontology
B.A. 1956, M.A. 1960, University of Missouri; Ph.D. 1963, Louisiana State University and Agricultural and Mechanical College

Richard C. Henneberry, *Senior Scientist, Laboratory of Molecular Biology, National Institute of Neurological and Communicative Disorders and Stroke*; Physiology (Cellular Receptors and Membranes)
B.A. 1950, St. Michael's College; M.S. 1966, Ph.D. 1969, University of Massachusetts

Ronald Herberman, *Head, Cellular and Tumor Immunology Section, Laboratory of Cell Biology, National Cancer Institute*; Tumor Immunology
B.A. 1960, M.D. 1964, New York University

Peter N. Herbert, *Director, Division of Clinical and Experimental Atherosclerosis, The Miriam Hospital*; Biochemistry (Lipoproteins)
B.S. 1963, Rensellaer Polytechnic Institute; M.D. 1967, Yale University

Gary Hodgen, *Chief, Section on Endocrinology, Reproduction Research Branch, National Institute of Child Health and Human Development*; Physiology (Reproductive Endocrinology)
B.Sc. 1965, M.Sc. 1966, Purdue University; Ph.D. 1969, Ohio State University

Jane M. Holmes, *Staff Neuropsychologist, Department of Psychiatry, Children's Hospital Medical Center*; Psychology (Learning Disabilities)
B.A. 1966, University of Durham, England, Ph.D. 1973, University of Edinburgh, Scotland

Loren Horton, *State Historical Society of Iowa*; American Civilization (History of Iowa)
B.A. 1955, M.A. 1960, University of Northern Iowa

Richard Houbrick, *Supervisory Marine Biologist, Oceanographic Sorting Center, Smithsonian Institution*; Biological Sciences (Malacology)
B.A. 1959, St. Bernard College; M.S. 1967, University of Miami; Ph.D. 1971, University of South Florida

Thelma Hunt, *Professor Emeritus of Psychology*; Abnormal Psychology
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

David Jacobowitz, *Chief, Section on Histopharmacology, Laboratory of Clinical Science, National Institute of Mental Health*; Pharmacology (Neuropharmacology)
B.S. 1953, City University of New York, City College; M.S. 1958, Ph.D. 1962, Ohio State University

Elizabeth D. Jacobson, *Chief, Light Radiation Branch, Division of Risk Assessment, National Center for Devices and Radiological Health*; Genetics (Light Radiation)
B.A. 1970, State University of New York at Binghamton, Ph.D. 1975, Georgetown University

Meredith Leam Jones, *Curator, Division of Worms, Smithsonian Institution*; Invertebrate Zoology
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Shung-chang Jong, *Head, Mycology Department, American Type Culture Collection*; Microbiology
B.S. 1960, National Taiwan University; M.S. 1966, Western Illinois University; Ph.D. 1969, Washington State University

Carl Donald Kahn, *Chief, Section on Cellular and Molecular Physiology, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases*; Cellular and Molecular Physiology
B.A. 1964, M.D. 1968, University of Louisville

Robert Konrad Kahn, *Psychotherapist (Private Practice)*; Psychotherapy
B.A. 1946, University of Pennsylvania; M.A. 1953, George Washington University; Ph.D. 1957, Pennsylvania State University

Myron J. Katzoff, *Chief, Research and Methods Branch, Bureau of the Census*; Statistics
M.S. 1963, University of Maryland; M.Phil. 1973, Ph.D. 1976, George Washington University

Kenneth L. Kirk, *Research Chemist, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases*; Chemistry (Fluorination Procedures)
B.A. 1959, DePauw University; Ph.D. 1963, University of Wisconsin

Claude Elise Blanc Klee, *Chief, Section on Macromolecular Interactions, National Cancer Institute*; Biochemical Pharmacology
M.D. 1959, University of Marseille

Marvin W. Kranz, *Specialist in American History, Library of Congress*; American Civilization (American History)
B.A. 1951, Ph.D. 1961, Syracuse University

Floyd M. Kregenow, *Senior Member, Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung, and Blood Institute*; Membrane Transport Processes
B.S. 1957, Rutgers—The State University; M.D. 1962, Yale University

Donald M. Kuhn, *Senior Staff Fellow, Section on Biochemical Pharmacology, National Heart, Lung, and Blood Institute*; Pharmacology (Hypertension-Endocrine)
B.S. 1972, Presbyterian College; Ph.D. 1976, University of South Carolina

Wayne Lednar; Human Ecology (Epidemiology and Occupational Health)
B.S. 1971, Fordham College; M.S. 1973, University of Massachusetts; Ph.D. 1975, University of North Carolina; M.D. 1979, George Washington University

Laurence Pereira Leite, *Professor Emeritus of Art*; Art History
M.A. 1956, Ph.D. 1966, Johns Hopkins University
M.D. 1962, University of Chicago

Lawrence Stephen Lessin, *Professor of Medicine and Pathology, George Washington University School of Medicine and Health Sciences*; Physiology
M.D. 1962, University of Chicago

Robert Levy, *Director, Division of Heart and Vascular Diseases, National Heart, Lung, and Blood Institute*; Biochemistry (Lipoproteins)
B.A. 1957, Cornell University; M.D. 1961, Yale University

Marc E. Lippman, *Head, Medical Breast Cancer Section, Medicine Branch, National Cancer Institute*; Endocrinology and Metabolism
B.A. 1964, Cornell University; M.D. 1968, Yale University

Darrell Liu, *Acting Section Chief, Biochemistry of Microbial Structure, National Institute of Child Health and Human Development*; Peptides and Protein Structure
B.S. 1955, National Taiwan University; Ph.D. 1961, University of Pittsburgh

David R. Livengood, *Research Physiologist, Department of Neurobiology, Armed Forces Radiation Biology Research Institute*; Physiology of Synapse, Membrane Biophysics, and Sodium Transport Mechanisms
B.A. 1960, Butler University; Ph.D. 1970, Indiana University

Donald Lynn Loriaux, *Head, Developmental Endocrinology Section, National Institute of Child Health and Development*; Endocrine and Reproductive Pharmachology
B.S. 1962, Colorado State University; M.D. 1967, Ph.D. 1968, Baylor College of Medicine

Walter McKay Lovenberg, *Head, Section on Biochemical Pharmacology, Hypertension-Endocrine Branch, National Heart, Lung, and Blood Institute*; Structure and Function of Proteins
B.S. 1956, M.S. 1958, Rutgers—The State University; Ph.D. 1962, George Washington University

Philip Lundeberg, *Curator, Division of Naval History, Smithsonian Institution*; American Civilization (Military and Naval History)
B.A. 1947, M.A. 1954, Duke University; Ph.D. 1955, Harvard University

William Madow, Statistics (Sample Survey Design)
B.A. 1933, M.A. 1933, Ph.D. 1938, Columbia University

Rose Mage, *Career Investigator, Laboratory of Immunology, National Institute of Allergy and Infectious Diseases*; Immunogenetics
B.S. 1956, Cornell University; Ph.D. 1963, Columbia University

Charles R. Manclark, *Research Microbiologist, Bureau of Biologics, U.S. Food and Drug Administration*; Microbiology (Microbial Physiology)
B.S. 1953, California State Polytechnic University; Ph.D. 1963, University of California, Los Angeles

Ronald W. Manderscheid, *Senior Research Sociologist, National Institute of Mental Health*; Sociology (Socialization and Stratification)
B.A. 1965, Loras College; M.A. 1967, Marquette University; Ph.D. 1975, University of Maryland

S. Branson Marley, Jr., formerly *Chief, Serial Division, Library of Congress*; American Civilization (History of Journalism)
B.A. 1937, University of North Carolina

Marlene Mayo, *Associate Professor of History, University of Maryland*; American Civilization (U.S.–East Asian Relations)
B.A. 1954, Wayne State University; M.A. 1957, Ph.D. 1961, Columbia University

Scott R. Mazzur, *Senior Research Scientist, Blood Research Laboratory, The American National Red Cross*; Microbiology (Immunology)
B.A. 1957, Rutgers—The State University (Douglass College); Ph.D. 1966, University of Pennsylvania

Barbara F. Meeker, *Associate Professor of Sociology, University of Maryland*; Sociology (Mathematical Sociology)
B.A. 1961, University of Kansas; M.A. 1964, Ph.D. 1966, Stanford University

John L. Middlebrook, *Research Chemist, Pathology Division, U.S. Army Medical Research Institute of Infectious Diseases*; Biological Sciences (Bacterial Biochemistry)
B.S. 1968, Pacific University; Ph.D. 1972, Duke University

Lillian B. Miller, *Historian of American Culture, National Portrait Gallery*; American Civilization (Art History)
B.A. 1943, Radcliffe College; M.A. 1948, Ph.D. 1962, Columbia University

Mortimer Mishkin, *Research Psychologist, Section on Neuropsychology, National Institute of Mental Health*; Experimental Psychology
B.A. 1948, Dartmouth College; M.A. 1949, Ph.D. 1951, McGill University

Jerry Mitchell, *Chief, Section on Clinical Pharmacology and Metabolism, Office of the Director of Intramural Research, National Heart, Lung, and Blood Institute*; Pharmacology
B.A. 1963, University of Kentucky; M.D. 1968, Ph.D. 1969, Vanderbilt University

Brian R. Murphy, *Staff Associate, Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases*; Virology
B.A. 1964, Wesleyan University; M.D. 1969, University of Rochester

Brian C. Myhr, *Section Head, Department of Genetics and Cell Biology, Litton Bionetics, Inc.*; Genetics
B.S. 1961, Ph.D. 1966, Iowa State University

David L. Nelson, *Senior Investigator, Metabolism Branch, National Cancer Institute*; Microbiology (Immunology)
B.S. 1966, Washburn University of Topeka; M.D. 1970, University of Kansas

Stephen Oroszlan, *Head, Immunochemistry Section, Biological Carcinogenesis Program, Frederick Cancer Research Center*; Microbiology (Virology)
M.S. 1950, Technical University, Budapest; Ph.D. 1960, Georgetown University

James Clark Osborne, Jr., *Staff Fellow, National Heart, Lung, and Blood Institute (Molecular Branch);* Genetics (Physical Chemistry of Macromolecules)
B.A. 1970, M.S. 1972, Ph.D. 1974, University of Maryland

Diane Brickley Parsons, *Assistant Research Professor of Orthopedic Surgery, George Washington University School of Medicine and Health Sciences;* Biochemistry (Collagen)
B.A. 1968, Newton College; Ph.D. 1973, Boston University

Andrew Peacock, *Supervisory Research Chemist, National Cancer Institute;* Biological Sciences (Cell Biology)
B.S. 1943, M.S. 1947, Ph.D. 1949, Massachusetts Institute of Technology

John Pisano, *Head, Section of Physiological Chemistry, Experimental Therapeutics Branch, National Heart, Lung, and Blood Institute;* Physiological Chemistry
B.S. 1951, Pennsylvania State University; M.S. 1953, Ph.D. 1955, Rutgers—The State University

John W. Porter, *Chief, Lipid Metabolism Laboratory, and Professor, Department of Physiological Chemistry, University of Wisconsin;* Biochemistry (Lipid Metabolism)
B.S. 1938, Ph.D. 1942, University of Wisconsin

Robert Miles Pratt, Jr., *Research Chemist, Craniofacial Anomalies Section, Laboratory of Developmental Biology and Anomalies, National Institute of Dental Research;* Pharmacology (Biochemical Teratogenesis)
B.A. 1965, M.A. 1966, University of Colorado; Ph.D. 1970, Boston University

Ulf Rudiger Rapp, *Visiting Scientist, Viral Oncology Program, National Cancer Institute;* Genetics (Virology)
M.D. 1969, University of Freiburg, Germany; Ph.D. 1975, University of Wisconsin

Allen Raskin, *Research Psychologist, Psychopharmacology Research Branch, National Institute of Mental Health;* Psychopharmacology
B.A. 1949, Syracuse University; M.S., Ph.D. 1954, University of Illinois

Wayne D. Rasmussen, *Leader, Agricultural Historical Program, Economic Research Service, U.S. Department of Agriculture;* History (Agricultural History)
B.A. 1937, University of Montana, M.A. 1939, Ph.D. 1950, George Washington University

Stephen A. Rosenberg, *Chief of Surgery, National Cancer Institute;* Microbiology (Immunology)
B.A. 1960, M.D. 1963, Johns Hopkins University; Ph.D. 1968, Harvard University

George S. Roth, *Research Biochemist, Gerontology Research Center, National Institute on Aging;* Gerontology Research
B.S. 1968, Villanova University; Ph.D. 1971, Temple University

Brian Safer, *Head, Section on Protein Biosynthesis, Laboratory of Molecular Hematology, National Heart, Lung, and Blood Institute;* Genetics (Protein Biosynthesis)
B.S. 1964, Columbia University; M.S. 1967, M.D. 1969, Baylor College of Medicine; Ph.D. 1973, University of Pennsylvania

Alan N. Schechter, *Chief, Section on Macromolecular Biology, Laboratory of Chemical Biology, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases;* Biochemistry (Proteins)
B.A. 1959, Cornell University; M.D. 1963, Columbia University

Frank L. Schmidt, *Personnel Research Psychologist, Research Section, Personnel Research and Development, U.S. Civil Service Commission;* Psychology (Personnel Psychology)
B.A. 1966, Bellarmine College; M.S. 1968, Ph.D. 1970, Purdue University

Leonard Peter Schultz, *Curator of Fishes, Smithsonian Institution;* Vertebrate Zoology (Ichthyology)
B.A. 1924, Albion College; M.S. 1926, University of Michigan; Ph.D. 1932, University of Washington

David Segal, *Research Chemist, National Cancer Institute, National Institutes of Health;* Biochemistry (Immunoglobulins)
B.A. 1961, Oberlin College; Ph.D. 1966, Johns Hopkins University

Robert Sumner Sigafoos, *Botanist, U.S. Geological Survey;* Plant Ecology
B.S. 1942, M.S. 1943, Ohio State University; M.A. 1949, Ph.D. 1951, Harvard University

Lyman Bradford Smith, *Senior Botanist, Department of Botany, Smithsonian Institution;* Plant Taxonomy
B.A. 1925, M.A. 1926, Ph.D. 1930, Harvard University

Louis Sokoloff, *Chief, Laboratory of Cerebral Metabolism, National Institute of Mental Health;* Biochemistry (Brain Biochemistry)
B.A. 1943, M.D. 1946, University of Pennsylvania

Michael B. Sporn, *Chief, Laboratory of Chemoprevention, National Cancer Institute;* Pharmacology (Carcinogenesis and Cancer Chemotherapy)
B.S. 1952, Harvard University; M.D. 1959, University of Rochester

Thressa C. Stadtman, *Head, Section on Intermediary Metabolism and Bioenergetics, Laboratory of Biochemistry, National Heart, Lung, and Blood Institute;* Biochemistry (Intermediary Metabolism)
B.S. 1940, M.S. 1942, Cornell University; Ph.D. 1949, University of California

John R. Stephenson, *Head, Viral Genetics Section, National Cancer Institute;* Virology
B.S. 1965, University of British Columbia; M.S. 1968, University of Guelph, Canada; Ph.D. 1970, University of Toronto

Sarah Stewart, *Medical Director, Human Virus Leukemia Section, National Cancer Institute;* Viral Leukemia
B.S. 1927, New Mexico State University; M.S. 1930, University of Massachusetts; Ph.D. 1939, University of Chicago; M.D. 1949, Georgetown University

Keith Larry Storrs, *Analyst in Latin American Affairs, Congressional Research Service, Library of Congress;* Political Science (Latin American Government and Politics)
B.A. 1962, Brigham Young University; Ph.D. 1972, Cornell University

Celia White Tabor, *Staff Member, Laboratory of Biochemical Pharmacology, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases;* Biochemistry (Intermediary Metabolism)
B.A. 1940, Radcliffe College; M.D. 1943, Columbia University

Herbert Tabor, *Chief, Laboratory of Biochemical Pharmacology, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases;* Biochemistry (Intermediary Metabolism)
B.A. 1937, M.D. 1941, Harvard University

John F. Tallman, *Head, Section of Biochemistry and Pharmacology, National Institute of Mental Health;* Biochemistry (Complex Lipids)
B.S. 1968, Ph.D. 1972, Georgetown University

Robert Ting, *Scientific Director, Biotech Research Laboratories;* Virology
B.A. 1954, M.A. 1956, Amherst College; Ph.D. 1960, University of Illinois

Herman Viola, *Archivist, Anthropology Department, Smithsonian Institution;* American Civilization (Federal Indian Policy)
B.A. 1960, M.A. 1964, Marquette University; Ph.D. 1967, Indiana University

Peter Voytek, *Acting Director, Reproductive Effects Assessment Group, Environmental Protection Agency;* Genetics
B.A. 1963, Ph.D. 1969, University of Vermont

William C. Wallen, *Senior Staff Fellow, Infectious Diseases Branch, National Institute of Neurological and Communicative Disorders and Stroke;* Microbiology (Immunology)
B.S. 1965, M.S. 1968, Michigan State University; Ph.D. 1972, University of Arizona

Robert W. Wannemacher, Jr., *Senior Biochemist, Biochemistry and Nutrition, U.S. AMRIID, Fort Detrick;* Biochemistry (Biochemistry and Nutrition)
B.S. 1950, Wagner College; M.S. 1951, Ph.D. 1960, Rutgers—The State University

Wilcomb Edward Washburn, *Director, Office of American Studies, Smithsonian Institution;* American Civilization
B.A. 1948, Dartmouth College; Ph.D. 1955, Harvard University

Robert Louis Weintraub, *Professor Emeritus of Botany;* Biology
B.S. 1931, M.A. 1933, Ph.D. 1936, George Washington University

Stanley Howard Weitzman, *Curator of Fishes, Smithsonian Institution;* Biological Sciences (Ichthyology)
B.A. 1951, M.A. 1953, University of California, Berkeley; Ph.D. 1960, Stanford University

William G. Whittaker, *Analyst in Labor Economics, Congressional Research Service, Library of Congress;* American Studies (Labor History and Economics)
B.A. 1956, St. Martin's College; M.A. 1959, Ph.D. 1965, Georgetown University

Jerry Randall Williams, *Research Professor of Radiology and of Pharmacology, George Washington University School of Medicine and Health Sciences;* Pharmacology
B.A. 1957, Texas Christian University; B.Sc. 1960, M.Sc. 1960, National University of Ireland; D.Sc. 1972, Harvard University

Samuel H. Wilson, *Research Scientist, National Cancer Institute;* Biochemistry
B.A. 1961, University of Denver; M.D. 1966, Harvard University

FIELD OF STUDIES CONSULTANTS— GRADUATE SCHOOL OF ARTS AND SCIENCES

Robert V. Allen, *Soviet Area Specialist, Library of Congress;* U.S. and Russian Institutions in Social Change
B.Ed. 1943, Southern Illinois University; M.A. 1945, Ph.D. 1950, Yale University

Irving Breger, Research Chemist, *Coal Resources Branch, U.S. Geological Survey;* Organic Geochemistry
B.S. 1941, Worcester Polytechnic Institute; M.S. 1947, Ph.D. 1950, Massachusetts Institute of Technology

Grose Evans, *Curator, Loans and Exhibitions, National Gallery of Art;* American Civilization (English Art History)
B.F.A. 1941, M.A. 1942, Ohio State University; Ph.D. 1953, Johns Hopkins University

Alan Fern, *Director, National Portrait Gallery;* American Civilization (American and European Cinema)
B.A. 1950, M.A. 1954, Ph.D. 1960, University of Chicago

Joseph Fulton, *Specialist in Labor Economics and Relations, Congressional Research Service, Library of Congress;* American Civilization (Labor History)
B.A. 1946, M.A. 1948, New York University

Richard P. Hallion, *Associate Professor, University of Maryland;* American Civilization (Aerospace History)
B.A. 1970, Ph.D. 1975, University of Maryland

Harry J. Hogan; American Civilization (American Legal History)
B.A. 1937, Princeton University; LL.B. 1947, Columbia University; Ph.D. 1971, George Washington University

Alan Jabbour, *Director, Folk Arts Division, National Endowment for the Arts;* American Civilization (Folk Music)
B.A. 1963, University of Miami; M.A. 1966, Ph.D. 1968, Duke University

Barbro Klein; American Civilization (Scandinavian Folklore)
Fil.kand. 1961, Stockholm University; Ph.D. 1970, Indiana University

John Bennett Kuiper, *Head, Motion Picture Section, Division, Prints and Photographs, Library of Congress;* American Civilization (Mass Media—Movies and Television)
B.A. 1950, University of Kentucky; M.A. 1957, Ph.D. 1960, University of Iowa

Vernon McKay, *Professor of African Studies, School for Advanced International Studies, Johns Hopkins University*; African History
B.A. 1933, Baker University; M.A. 1934, Syracuse University; Ph.D. 1939, Cornell University

Michael Moloney; American Civilization (British Folklore)
B.A. 1966, M.A. 1968, University College, Dublin

James Newcome Norris IV, *Associate Curator, Algae Department of Botany, National Museum of Natural History, Smithsonian Institution*; Biology (Marine Botany)
B.A. 1968, M.A. 1971, San Francisco State College; Ph.D. 1975, University of California, Santa Barbara

James Clark Osborne, Jr., *Staff Fellow, National Heart, Lung, and Blood Institute, Molecular Disease Branch*; Genetics (Molecular Diseases)
B.A. 1970, M.S. 1972, Ph.D. 1974, University of Maryland

Neil L. Sass, *Division of Toxicology, Bureau of Foods, Food and Drug Administration*; Biochemistry (Food Toxicology)
B.S. 1966, Wake Forest College; Ph.D. 1971, West Virginia University

Samuel I. Shibko, *Chief, Natural and Environmental Toxicants Branch, Division of Toxicology, Bureau of Foods, Food and Drug Administration*; Biochemistry (Food Toxicology)
B.Sc. 1954, University of Birmingham, England; Ph.D. 1958, University of London

Paul C. Spehr, *Assistant Chief, Motion Picture, Broadcasting, and Recorded Sound Division, Library of Congress*; American Civilization (American Cinema)
B.A. 1953, Kenyon College

Julian Wood Witherell, *Head, African Section, Library of Congress*; American Civilization (African History)
B.A. 1956, Bowdoin College; M.A. 1958, Ph.D. 1964, University of Wisconsin

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School of Education and Human Development: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

School of Government and Business Administration: Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Urban and Regional Planning (M.U.&R.P.), Post-Master's Graduate Certificate in Health Services Administration (Grad. Cert. in H.S.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

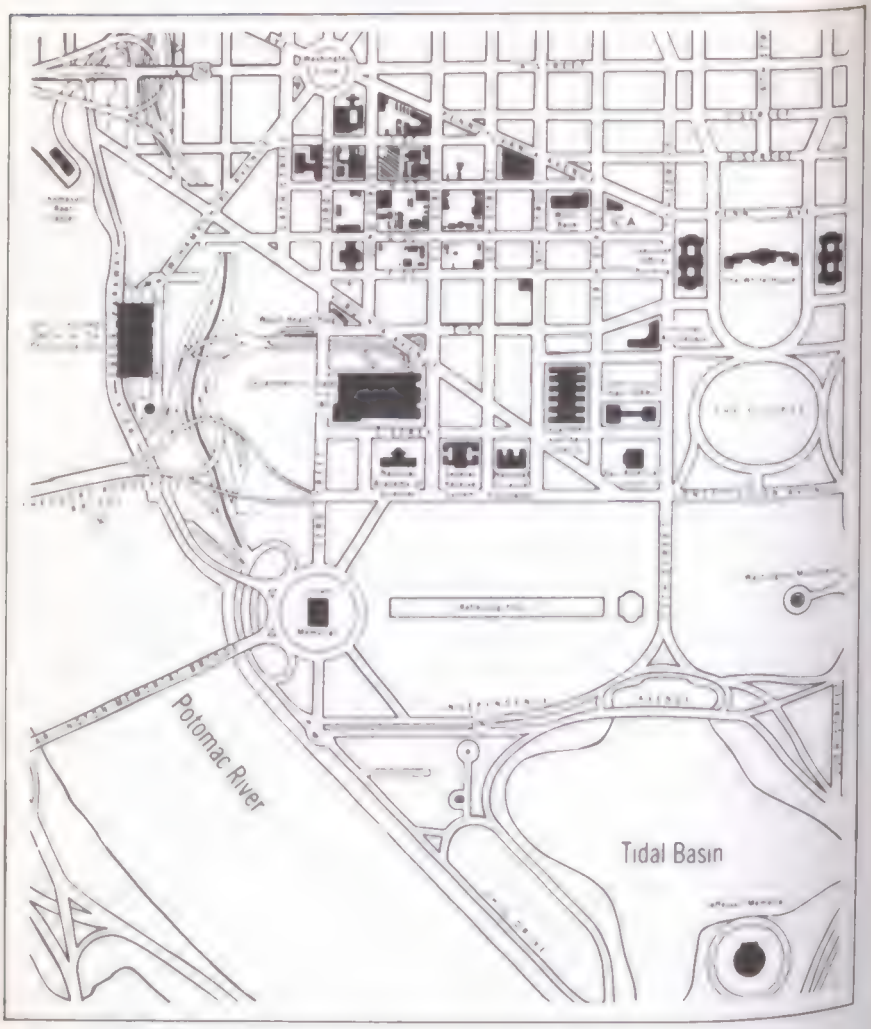
School of Public and International Affairs: Bachelor of Arts (B.A.) and Master of Arts (M.A.)





The George Washington University

School of Medicine and Health Sciences Bulletin 1983–1984



The George Washington University Campus / Washington, D.C.

The George Washington University
School of Medicine and Health Sciences Bulletin
October 1983

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School of Medicine and Health Sciences Bulletin 1983–1984

Washington, D.C. 20052



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Calendar 1983–1984*

August 1983

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September 1983

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November 1983

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December 1983

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January 1984

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April 1984

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May 1984

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June 1984

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July 1984

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29	30	31				

July 5	Beginning of third- and fourth-year clerkships
August 18, 19	Orientation and registration for first-year students
August 22	First day of classes for first-year students
August 29	First day of classes for second-year students
September 1	Registration for second-, third-, and fourth-year students
September 5	Labor Day (holiday for first- and second-year students)
November 23	Thanksgiving vacation begins after classes for first- and second-year students
November 28	Return from vacation
December 16	Winter vacation begins at 5 p.m. for first- and second-year students
January 2	Classes resume
January 12	Spring registration for all students
February 20	Washington's Birthday (holiday for first- and second-year students)
March 9	Spring break begins after classes for first- and second-year students
March 19	Return to classes
May 18	Last day of classes for first- and second-year students
May 21–25	Examination period for first- and second-year students
May 25	Commencement
June 22	End of third- and fourth-year clerkships

* This calendar is subject to change. Although registration is conducted in both August and January, there is no precise date for the end of the fall semester; some courses end before winter recess, whereas others begin before January registration.

The University

History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining firsthand a knowledge of the practice and theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted the charter that was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and one-half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. Within a few blocks are the White House, the Department of the Interior, the State Department, the World Bank, and many other governmental offices and international agencies. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and

Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; the Division of Continuing Education and Summer Sessions; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an *ex officio* member.

Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board. The Department of Chemistry is on the approved list of the American Chemical Society.

The School of Medicine and Health Sciences has had continuous approval by the Council on Medical Education of the American Medical Association and the Association of American Medical Colleges. The Doctor of Medicine degree of the School of Medicine and Health Sciences is recognized by all state and territorial medical licensure boards in the United States.

University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

Cloyd Heck Marvin Center

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the academic departments, and student and faculty organizations.

The Center Governing Board, representative of all elements of the University community, plays an important role in the day-to-day functioning of the center. This board works closely with the full-time staff in the development of the procedures and policies that provide a framework for the center's operation.

Recreation

The nation's capital provides abundant recreational resources, a large number of which are available at little or no cost. There are numerous art galleries, museums, concert halls, theaters, swimming pools, parks, and places of historic interest. Social activities are provided by student organizations of the University, the School of Medicine and Health Sciences, and University-sponsored programs such as intramural sports, concerts, recitals, and dramatic productions. Washington is one of the most colorful cultural and scientific centers of the world.

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Harold Frederick Bright, Ph.D., *Provost and Vice President for Academic Affairs*
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*Alumni trustee

The School of Medicine and Health Sciences

Officers of Administration of the Medical Center

Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs and Executive Dean of the Medical Center*

The Vice President and Executive Dean is the chief executive officer of the Medical Center, with overall responsibility for all programs of the Center. As chief executive officer, the Vice President is also the recipient of the Walter A. Bloedorn Professorship of Administrative Medicine, established by the Walter A. Bloedorn Foundation in memory of the late Dean of the Medical Center.

Office of Academic Affairs

The Office of Academic Affairs bears the responsibility for the curriculum; student affairs, including scholarship and financial aid; research and sponsored programs; allied health programs; educational evaluation; admissions; and support services of the library and audiovisual and animal facilities.

Lawrence Thompson Bowles, M.D., Ph.D., *Dean for Academic Affairs*
Robert Keimowitz, M.S., M.D., *Associate Dean for Student Affairs and Admissions*
Fred Leonard, Ph.D., *Associate Dean for Research*
Winfield Harker Scott, Ph.D., *Associate Dean for Education and Director of Education*
Jarrett Michael Wise, B.S in A.H.S., *Assistant Dean*

Office of Administrative Affairs

The Office of Administrative Affairs is responsible for the administration of the University Hospital and the Medical Faculty Associates, for support services to the School of Medicine and Health Sciences, and for the financial management of the Medical Center.

Philip Stanley Birnbaum, M.S. in M.E., B.C.E., *Dean for Administrative Affairs*
Michael M. Barch, M.B.A., *Administrator of the Medical Center*
Thomas James Carroll, B.A., *Director of Financial Services*
Bruce Johnson Dietz, B.A., M.S., *Director of Management Information*

Office of Clinical Affairs

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and the Medical Faculty Associates and for the supervision of the graduate and continuing medical education programs and community affiliation programs.

Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs*
Sheila McCarthy, B.S.N., *Director of Nursing*
Thomas Eugene Piemme, M.D., *Assistant Dean for Continuing Education*
Robert James Van Houten, B.S., M.D., *Associate Dean for Graduate Medical Education*

History

The School of Medicine and Health Sciences of the George Washington University has a distinguished history that goes back more than a century and a half. In March 1825 the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences on which they have built medical careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels the academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates; the Helen L. and Mary E. Warwick Memorial Building; and affiliated hospitals.

In 1973, with the introduction of undergraduate programs in allied health sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.

Regulations

A student enrolled in the University is required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which he or she is registered.

A student who withdraws or is suspended, or is otherwise absent from the University for one semester or more, may reenter and continue scholastic work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the faculty) for subsequent registration in the University.

Registration

Attendance in class requires compliance with the School's registration deadlines.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate; and
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; number of semester hours of credit earned; degrees earned; honors



received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Definition of Satisfactory Academic Progress and Good Standing

Medical education at the George Washington University School of Medicine and Health Sciences is demanding, and student progress is carefully monitored. Therefore, any matriculated student who has not withdrawn or been dismissed is considered in good standing and making satisfactory academic progress. No student is allowed to continue his or her course work at the School if he or she is considered by the faculty of the School not to be capable of attaining the M.D. degree. This policy is fully consistent with the Regulations for M.D. Candidates. Federally regulated financial assistance programs will not be approved for students who are not in regular attendance and do not meet the School's standards for good standing and satisfactory academic progress.

University Policy on Drugs

The University cannot condone violations of law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

The Libraries

Students have the privilege of using the Melvin Gelman Library and the School of Medicine and Health Sciences Library. The stacks are open, and all students are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

All students using the libraries are expected to be familiar with the regulations governing their use, which are available at each library.

Property Responsibility

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

Student Affairs

The Office of the Vice President for Student and Alumni Affairs develops student life programs, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Services, Student Activities, Alumni, Student and Alumni Career Services, Student Health Service, and Services for Students with Disabilities. More detailed information on these and other activities is contained in the *Student Handbook*.

Student Health Service

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits are free of charge and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost; many common medications are stocked to fill students' prescriptions; and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in the Division of Continuing Education and Summer Sessions and the Continuing Engineering Education Program of the School of Engineering and Applied Science are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student

Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those full-time students who do not have other coverage. Students are encouraged to carry adequate health insurance coverage for themselves and, if married, for their spouses and children. Interested students should contact the Student Health Service.

Housing for Undergraduate Allied Health Students

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing may also be obtained at this Office. Arrangements for private housing must be made by students.

Admission to the University does not include a room reservation. The student will receive, with notification of acceptance, University residence hall information, an application for residence hall space, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodations must be accompanied by a $200 ***nonrefundable deposit***. The housing deposit is either credited toward the first semester's room charge or held as a security deposit on an apartment. Rooms and apartments are leased for the academic year, September to May, and lease payment must be made in early June for the fall semester. Physician assistant and nurse practitioner applicants are not encouraged to apply for University housing in view of their extended academic year.

1983–84 Residence Hall Rates per Person for Two Semesters*

For Men

Calhoun Hall	
double room	$2,060
triple room	2,000

For Women

Strong Hall	
single room	2,230
double room	2,060
triple room	2,000

For Men and Women

Crawford Hall	
double room	2,060
Everglades Hall† (limited to juniors and seniors)	
apartment for two persons	2,280 or 2,170

*Residence hall prices and allocation are subject to change

†Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate

Building JJ (limited to sophomores, juniors, and seniors)	
apartment for four to six persons	$2,140
Francis Scott Key Hall (limited to juniors and seniors)	
apartment for one person	2,380
apartment for two persons	2,380
apartment for three persons	2,270 or 2,140
Madison Hall	
double room	2,060
triple room	2,000
Milton Hall* (limited to juniors and seniors)	
apartment for two persons	2,290 or 2,190
apartment for three persons	2,080
Mitchell Hall	
single room	2,230
Munson Hall* (limited to juniors and seniors)	
apartment for two persons	2,290 or 2,190
apartment for three persons	2,080
Thurston Hall	
double room, triple room, room for four	2,060
suite for six	1,930

Guthridge Apartments

This apartment house is a University-owned, commercially operated building within the campus area. It contains efficiency and one-bedroom units that are rented only to full-time graduate students on an "as available" basis. Referrals to the resident manager of this building are made by the Director of Housing and Residence Life when notice is received of vacancies. Leases are executed with the management company and are on a month-to-month basis.

Food Service†

Resident allied health students in the freshman and sophomore years are required to choose one of the following three food service plans: the seven-day, 19 meals per week plan, at the rate of $1,632 for the academic year; the any 14 meals per week plan for $1,566 for the academic year; or the any 10 meals per week plan at $1,512 for the academic year. Participation in the food service plan is optional for junior, senior and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit the bearer to dining rooms in Thurston and Mitchell Halls and to the second-floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and in the Rathskeller (George's).

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Office of Housing and Residence Life regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

*Residents must pay electricity bills which do not include the cost of heating, in addition to the stated rate.

†Food service prices are subject to change.

Veterans Benefits

The Veterans Benefits Office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting an application to the Veterans Administration. All such students should obtain from the veterans counselor the instruction sheet that sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is located at 941 North Capitol St., N.E., Washington, D.C. 20421.

Facilities

Walter G. Ross Hall

Walter G. Ross Hall was dedicated and opened in 1973. This facility provides the teaching and laboratory facilities for students in the School of Medicine and Health Sciences. It occupies a city block on the northwest edge of the University campus; its gross area is approximately 550,000 square feet, or more than 10 acres. The building is equipped with audiovisual and other teaching equipment as well as basic science laboratories.

Educational Support Services

Educational Support Services is a group of core facilities and services supportive of the educational, clinical, and research missions of the Medical Center. Coordinated by the Associate Dean for Education, the services include the Office of Education, the Office of Audiovisual Education, the Office of Academic Computer Services, and the Paul Himmelfarb Health Sciences Library.

Office of Audiovisual Education and Services, Frank Allan, Ph.D., Director—The goal of this Office is to facilitate learning and communication throughout the Medical Center by appropriate application of media technology. Consultation is provided in the use of nonprint media in educational, clinical, and research programs. The Office provides displays of audiovisual materials and programs in classrooms, in the Audiovisual Study Center of the Himmelfarb Library, and throughout the Medical Center. It has highly developed production capabilities that are available to students and faculty, which include photographic, illustration, cinematographic, and television studios and a print shop. Virtually all learning spaces at the Medical Center are equipped for still and motion projection and television display. Spaces subject to frequent use are equipped with permanent systems for projection, sound amplification, and recording designed to support staff and student presentations.

Office of Academic Computer Services, Helmuth F. Orthner, Ph.D., Director—This Office supports educational activities of the Medical Center with services such as educational testing, maintenance of test-item data banks, assistance in the design, construction, and duplication of written PMP examinations, student feedback evaluation, course registration, CME credit reporting, conference management support, and automation of library procedures and inventories. The Office also supports small research data bases for investigations requiring interactive data maintenance or for projects using forms that can be optically scanned. Sophisticated statistical processing can be achieved by transmitting research data to the GWU Center for Academic and Administrative Computing's IBM mainframe with our on-line communications interface and processing the data with the appropriate statistical package. The Office also has facilities for word processing and a number of interactive psychodiagnostic questionnaires and histories for use by research investigators. It serves as an interface for computer-assisted educational material from the Massachusetts General Hospital and the Ohio State University.

The facilities of the Office consist of an on-line optical scanner (NCS 7001), a DEC PDP 11/60 minicomputer using the ANSI STANDARD M[U]MPS language environment, an on-line RJE 3780 communications link to the University Center for Academic and Administrative Computing (IBM 4341), a Gandalf communications facility to connect terminals from various locations of the School via dedicated lines using high-speed modems, and several dial-up ports for the switched telephone network.

Office of Education, Rhonda M. Goldberg, M.A., Director—The primary task of the Office of Education is to work with faculty and students to improve the educational enterprise. The Office conducts evaluations of courses and curricula and works toward the establishment of effective systems for evaluating student performance. Consultation is provided to faculty in support of their teaching skills, to students in support of their efforts to learn, and to the Office of Academic Affairs in support of its administration of the educational program.

Paul Himmelfarb Health Sciences Library, Shelley Bader, M.L.S., Director—The Library's collection of more than 76,000 volumes and approximately 1,300 journal subscriptions serves the educational, research, and patient care needs of the Medical Center. These resources are further enhanced by audiovisual media housed in the Library's Bloedorn Audiovisual Study Center, which supplement and complement the educational programs of the School of Medicine and Health Sciences.

Specialized information services are provided through computerized on-line bibliographic services that access a multitude of bibliographic and information data bases, including MEDLINE, produced by the National Library of Medicine (NLM). The Himmelfarb Library is an active participant in NLM's Regional Medical Library Program, which facilitates interlibrary borrowing to meet the need for materials not available within users' libraries.

Through formal class presentations and instruction provided on an individual basis, the library staff instructs users in effective use of materials and research strategies to meet specific information needs. Special student services include an extensive collection of reserve materials designed to assist students with curriculum needs. In addition, the Library works closely with the Office of Education to provide materials to assist students with their educational planning.

The Himmelfarb Library, located adjacent to Ross Hall, can accommodate approximately 400 users. Facilities include a smoking lounge, a typing room, a conference room, group study rooms, and individual study carrels.

The George Washington University Hospital

The George Washington University Hospital is adjacent to the School of Medicine and Health Sciences and is an acute care facility with 511 adult beds and 56 bassinets. It serves as the primary teaching site for students in the School of Medicine and Health Sciences and for more than 400 physicians participating in the 19 accredited postgraduate training programs offered by the Medical Center. The Hospital records approximately 22,000 patient admissions each year and provides a broad range of tertiary care services to an equally broad-based patient population. Patient origin studies indicate a concentration of patients from Washington, D.C., and suburban Maryland; but the actual hospital service area extends well into the entire Washington metropolitan area, and patients come from all states of the nation and several foreign countries.

The Medical Faculty Associates (MFA) is a private group practice of 160 full-time physicians who practice exclusively at the Hospital and are dedicated to its mission of education and quality patient care. The MFA physicians comprise the full-time clinical faculty at the Medical Center and represent all medical specialties, including the hospital-based specialties of radiology, pathology, anesthesiology, and emergency medicine. The MFA physicians receive approximately 110,000 patient office visits annually. The Emergency Medicine Group staffs the Hospital Emergency Room—one of the busiest in the city—and contributes another 43,000 visits per year. The MFA physicians' offices are consolidated in the 13-story H.B. Burns Memorial Building, adjacent to the University Hospital.



The George Washington University Health Plan (GWUHP) is a health maintenance organization that was begun in 1972 to provide patient care and to provide students and house staff with educational experience in a prepaid health plan setting. The GWUHP has more than 21,000 subscribers.

The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility, which is available to physicians for patient evaluation.

Affiliated Hospitals

Children's Hospital National Medical Center—Children's Hospital represents the Department of Child Health and Development at George Washington University School of Medicine and Health Sciences and offers a comprehensive clerkship experience for third-year students and a variety of elective opportunities in the fourth year. The hospital provides primary and tertiary care to children in the greater Washington area and is a referral center for children throughout the world.

Fairfax Hospital—This 656-bed voluntary community teaching hospital, part of a three-hospital system, serves a burgeoning suburban area and provides all clinical services, including psychiatry. Each year more than 31,000 patients are admitted for treatment, 6,200 babies are delivered, 21,300 surgical operations are performed, and 60,000 persons are examined and treated in the Emergency Suite. Fairfax Hospital offers a rotating internship program, a School of Medical Technology, and clinical facilities for a School of Practical Nursing. Students of the School of Medicine and Health Sciences serve at this hospital in clinical clerkship and elective programs. Fairfax Hospital is an affiliated hospital for residency training in obstetrics and gynecology in the George Washington University Medical Center Program.

Holy Cross Hospital—Holy Cross, a modern 450-bed hospital, is a primary clinical campus that provides students with firsthand exposure to the practice of medicine in the community. It is a private, voluntary facility in which the full range of medical, surgical, and pediatric services is provided for a growing suburban population. Last year more than 20,000 patients were hospitalized, nearly 43,000 emergency visits were registered, and 3,953 babies were delivered at Holy Cross. The hospital has consistently experienced one of the highest occupancy rates in the metropolitan area.

National Naval Medical Center—The National Naval Medical Center, Bethesda, Maryland, is a 500-bed general hospital that offers a wide range of specialized services, clinical research, and educational programs. Medical care is provided to active-duty and retired military personnel and their dependents. It is a major referral center for thoracic and cardiovascular surgery as well as for cancer therapy. The teaching staff directs internship, residency, and fellowship programs in 25 specialties.

Saint Elizabeths Hospital—Saint Elizabeths Hospital, established by an 1852 Act of Congress, is a federal psychiatric hospital funded by and administered under the Department of Health and Human Services. This hospital provides for the treatment and care of approximately 5,000 persons, largely residents of the District of Columbia, of whom approximately 1,600 are inpatients in residence at any time. The Hospital staff includes a variety of specialists and support personnel, who enable it to conduct psychiatric evalua-

tions and deliver treatment using a wide range of therapeutic modalities. The hospital maintains an up-to-date health sciences library.

Medical students of George Washington University use the facilities of Saint Elizabeths for part of their clinical psychiatric training. A continuing research program is conducted at the hospital under a cooperative arrangement with the National Institute of Mental Health.

Veterans Administration Medical Center—In addition to providing medical, surgical, psychiatric, neurological, tubercular, and physical medicine and rehabilitation services, this 708-bed medical center has a large outpatient program; an extensive medical research program; programs in open-heart surgery, cobalt therapy, and renal dialysis; a metabolic program; and a specially designed Administrative Research Laboratory.

Washington Hospital Center—This 910-bed private, not-for-profit institution serves the greater Washington area through patient care, teaching, and research. The Center is the busiest hospital in the area, with approximately 30,600 admissions each year. An active emergency department treats more than 44,000 patients annually, and a separate facility for acute resuscitation of critically ill and injured patients treats another 1,000 each year. A 74-bed intensive care tower supports not only the trauma and medical services but also the very active cardiology and open-heart surgery programs and the area's only adult burn service. The center offers approved postgraduate programs in all specialties except psychiatry and pediatrics for 205 residents and fellows. In addition, clinical rotations or teaching programs are provided for nurses, medical technologists, x-ray technicians, and other allied health professionals.

Committees 1983–84

Academic Freedom and Ethics

B. Waxman *(Chairman)*, K.A. Kennedy, N.C. Kramer, K.D. Peusner, H.C. Pierpont, H. Sidransky, N.P. Trujillo

Admissions and Advanced Standing

F.C. Green *(Chairman)*, O.W. Donnelly, M. Fuchs, J.M. Giordano, C.E. Horn, K.E. Johnson, S.D. Rockoff, M.E. Tidball

Allied Health Programs

J.E. Ott *(Chairman)*, L.F. Affronti, C.A. DeAtley, G.R. Herer, T.N. Johnson, P. Klubes, T.W. Moody, S. Silver, D.B. Simon

Appointments, Promotions, and Tenure

R.S. Snell *(Chairman)*, D.O. Davis, B.S. Dunbar, M.J. Jackson, S.D. Loube, N.T. Tsangaris, C.U. Tuazon

Bylaws

W.S. Yamamoto *(Chairman)*, R.A. Kenney, M.J. Koering, J.N. Ramey, D. Reiss

Communications and Educational Resources

H.A. Emsellem *(Chairman)*, A.H. Einhorn, J.W. Gaskill, J.C. Kenealy, R.A. Kenney, L.E. Nochomovitz, M.L. Turner, L.M. Weiss

Continuing Medical Education

D. Ein *(Chairman)*, F.B. Brandt, R.F. Dyer, G.M. Fiskum, M.C. Hill, R.P. Jacobs, S. Koulouris, H.C. Miller, Jr., J.C. Oertel, J.M. Rosenstein, M.S. Smith, A.L. Trevsky, S.W. Wiesel, W.S. Yamamoto

Educational Evaluation

G.A. Walker *(Chairman)*, L.L. Gallo, F.C. Green, S.G. Kent, P.D. Kind, A.M. Kwart, R.A. Lavine, H.G. Mandel, W.W. Olmsted, G.J. Povar, J.N. Ramey, H.H. Trout III, R.J. Walsh, B. Waxman, P.H. White, J.M. Wiener

Educational Planning

J.C. LaRosa *(Chairman)*, J.K. Barber, E.M. Druy, H.A. Emsellem, A.J. Friedman, L.W. Greenberg, S.K. Irani, S.A. Karmi, W.W. Olmsted, J.M. Orenstein, L.G. Pawlson, R.F. Shesser, R.S. Snell, C.T. Spiegel, B. Stopak, J.A. Straw, G.E. Wagner, G.A. Walker, A.G. Wasserman, D.W. Watkins, J.M. Wise

Graduate Medical Education

R. DePalma *(Chairman)*, B.R. Kressel, F.J. Slaby

Public Relations

S.G. Kent *(Chairman)*, C.J. Bier, D.G. Borenstein, K.K. Davis, A.L. Goldstein

Student Affairs

C.A. Silva *(Chairman)*, J.A. Becker, J.H. Egan, B.L. Frankel, J.M. Gitelman, P.W. Poth, G.E. Wagner, B.C. Zook

Research

P.D. Kind *(Chairman)*, R.C. Bohn, E.W. Bradley, C.T. Garrett, G.W. Geelhoed, M.J. Jackson, K.A. Kennedy, D.S. Lee, J.E. Ott, G.C. Rosenquist, C.T. Spiegel, R.J. Stillman, C.W. Thompson, R.J. Walsh

Alumni and Allied Associations

The General Alumni Association

The objectives of this Association are to promote the general welfare of the University and to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing and any person who is or has been a member of the teaching, research, or administrative staff of the University or of the Board of Trustees of the University.

The affairs of the Association are directed by the Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

The George Washington University Medical Alumni Association

The George Washington University Medical Alumni Association, incorporated in 1959, continues the organization previously known as the George Washington University Medical Society.

The stated purposes of the Association are as follows:

> This shall be a nonprofit organization international in scope, whose objectives shall be to provide constructive services for the M.D. degree alumni of the George Washington University School of Medicine and Health Sciences for furthering the art and science of medicine, research, and for the promotion of the welfare of the George Washington University School of Medicine and Health Sciences, its students, the George Washington University Hospital and its trainees.

Active membership in the Association consists of all M.D. degree graduates of the School of Medicine and Health Sciences; current members and, on application, past members of the teaching staff of the School of Medicine and Health Sciences who hold doctoral degrees; and doctors of medicine who have had one or more years of postgraduate training in the George Washington University Hospital. Junior membership consists of all members of the student body of the M.D. degree program of the School of Medicine and Health Sciences.

The Medical Alumni Association maintains an office in the School of Medicine and Health Sciences.

Officers for 1982–83

President: William H. Cooper, M.D. 1949
President Elect: Allan Zellis, M.D. 1941
First Vice President: William Schewe, M.D. 1943
Second Vice President: Harry C. Beaver, M.D. 1963
Secretary: Robert Wineland, M.D. 1951
Treasurer: John Lyles, M.D. 1970

Council

Marvin Footer, M.D. 1942
Sidney Levine, M.D. 1941
Leon Levitsky, M.D. 1954
John Mermel, M.D. 1960
Stephen Pappas, M.D. 1956
Dee R. Parkinson, M.D. 1943

Alvin Parrish, M.D. 1945
Julius Piver, M.D. 1952
Morton J. Roberts, M.D. 1968
John Umhau, M.D. 1952



The Doctor of Medicine Degree Program

Admission

The George Washington University School of Medicine and Health Sciences seeks to enroll intellectually gifted, humanly sensitive, mature persons who will excel in the science and art of medicine. Applicants of diverse social and educational backgrounds have access to the admissions process. In the selection process there is no discrimination based on sex, race, color, religion, age, marital status, national or regional origin, or handicap.

Entrance Requirements

Admission to the First-Year Class

For admission to the Doctor of Medicine degree program, a minimum of 90 semester hours must have been earned in an accredited American or Canadian institution of higher learning. Credits earned in a professional school can be applied to the fulfillment of this minimum requirement only if they are acceptable by the applicant's college or university toward a bachelor's degree in arts or science. (A credit under the quarter system is two-thirds of a semester hour.) It is advantageous to complete four full years of undergraduate study. Only exceptional students are accepted upon completion of the minimum requirements.

It is possible for exceptional students with three years of undergraduate work in Columbian College of George Washington University to be admitted to this medical school and to receive a combined Bachelor of Arts–Doctor of Medicine degree. More detailed information on this program is given on page 28.

The following courses must be completed with satisfactory achievement before the applicant can be certified for matriculation. All required science courses must include sufficient laboratory work to give assurance of familiarity with the experimental methods and techniques of the disciplines.

Biology—Eight semester hours, including two semester hours of laboratory. This may be either in general biology or zoology but may **not** include separately credited courses in botany.

Chemistry—Eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory, and six to eight semester hours of organic chemistry, including laboratory.

Physics—Eight semester hours, including at least two semester hours of laboratory.

English—Six semester hours in composition and literature. This may be the usual introductory college course or its equivalent.

The number of required courses has been kept to a minimum to allow college students the time to pursue their own interests in depth. The Admissions Committee has no preference with regard to the major area of study of the applicant. Students with backgrounds in the arts, humanities, and social sciences are as admissible as applicants with science backgrounds. The Committee does expect that work in the student's chosen area of concentration

as well as in the required science courses will reflect scholarly interests and show evidence of significant achievement.

Admission With Advanced Standing

A number of recent developments require further deliberation by the faculty before an appropriately revised policy on advanced standing can be articulated. At the time of printing of the *Bulletin*, this review was not complete. Interested applicants are invited to write to the Office of Admissions of the School of Medicine and Health Sciences for final regulations.

Application Procedure

Application to the First-Year Class

Application forms are available from the Office of Admissions. All applicants are reminded that the submission of materially false or misleading information in application forms or in connection with the application process shall be grounds for rejection. If such submission is discovered after entrance into the School or award of a degree, it shall be grounds for dismissal or for revocation of the degree.

The School is a participant in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 1 of the year preceding that for which admission is sought.

After receipt of our copy of the AMCAS application, the Office of Admissions will send the applicant a Supplemental Application. This requests information not included on the AMCAS application. Submission of this supplemental application (due no later than December 15), including the nonrefundable supplemental application fee ($35), will initiate Admissions Committee processing of the application. On the basis of available information, some applicants will be asked to have letters of evaluation (recommendation) sent. After careful review of these documents, the committee will extend an invitation for interview to the most promising candidates. When these steps are completed, the application will be brought to the Admissions Committee for final decision. Applicants will be informed of final decisions immediately. Although it does not assume an obligation to report missing or erroneous credentials, the Admissions Office will try to contact the applicant if it is noted that necessary credentials are missing.

The School also participates in the AMCAS Early Decision Program. Interested applicants should read the AMCAS information booklet included with the AMCAS application materials. Early decision applicants should be aware that (1) they must submit their application by August of the year preceding that for which admission is sought and (2) for consideration the supplemental application and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1. Decisions on early decision candidates are usually made by October 1 and no later than October 15.

Applicants should refer to the AMCAS information booklet and to the admissions brochure available from the School of Medicine and Health

Sciences Office of Admissions for the most up-to-date information available at the time of application. Details included in those sources supersede information contained in this *Bulletin*.

Application With Advanced Standing

Information and applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037.

All applicants must complete an advanced standing application form and submit it with a $35 application fee no later than June 1.

Selection Procedures

To process the vast number of applications to this institution fairly and expeditiously, a screening evaluation system is utilized. This evaluation procedure screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), Medical College Admission Test (MCAT) scores, and pertinent extracurricular and work experiences. Some additional consideration is given to applicants from the District of Columbia and the neighboring metropolitan area as well as to applicants from George Washington University. There are no age limits.

When all credentials and interview reports are available, the application is reviewed by the Admissions Committee. In this review, although grades and MCAT scores are considered, major consideration is given to the essay portions of the applications, the letters of evaluation, and the interview reports, in an attempt to assess those motivational and personal characteristics that the committee feels are important in choosing future physicians.

Applicants who are offered a place in the class are required, within two weeks, to notify the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, in writing, of their intent to accept the place reserved. A deposit of $100 is also required by a specific date after notification of acceptance. The date will be given in the notice of acceptance. The deposit becomes nonrefundable two weeks prior to registration but will be credited toward the first semester's tuition.

Program of Study

The faculty and administration of the School of Medicine and Health Sciences have developed a curriculum designed to prepare each student for a professional life of continuous learning. Because students differ in background, ability, and career interests, the curriculum is balanced with required courses, and students are encouraged to maximize achievement within their own limits. It is presumed that all graduates will seek additional education in graduate training programs before assuming complete responsibility for independent clinical decision making.

In the first year, the student concentrates primarily on basic sciences. The course of study includes anatomy and biochemistry in the first semester. In the second semester, the student concentrates on physiology and microbiology in addition to an integrated course in neurobiology.

Freshman and sophomore medical students are permitted to register for electives for credit or use elective time at their discretion. The first two weeks of an elective are probationary, to enable students to decide whether it is suited to their needs. After completing the first two weeks of an elective, students are committed to complete the course requirements.

The second year integrates basic science and clinical information. Pathology and pharmacology provide the major basic science substrates. This academic program has been evolving since 1970, and several innovations have been introduced each year. The course of study is coordinated by a program director. Integration is accomplished through faculty subcommittees working with the program director and the second-year subcommittee on educational planning. Medical students are introduced to physical diagnosis during the first semester of the second year.

The final two years form a continuum of required clerkships and elective sequences designed to bring the student to optimal readiness for graduate training. Clerkships are required in medicine, surgery, pediatrics, obstetrics and gynecology, psychiatry, and health care sciences. Each student must complete a four-week acting internship in one of the following: medicine, pediatrics, or family medicine. In addition, each student must take a two-week clerkship in anesthesia and two two-week clerkships in orthopaedics, urology, or neurosurgery. All students must have a clinical course in neurosurgery or neurology.

A variety of elective experience is available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.

During the entire educational experience, students are encouraged to assume responsibility for their self-assessment and continued learning. It is the goal of the faculty to select and educate concerned human beings who will function productively and effectively during a long career in medicine.



Honors

Candidates who have completed the four-year course for the Doctor of Medicine degree and have received the grade of *H* (Honors) in courses amounting to 50% or more of the total number of semester hours taken may be recommended by the Executive Committee of the Medical Center for graduation "With Distinction."

Combined Degree Programs

Combined Bachelor of Arts and Doctor of Medicine

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 94 semester hours of prescribed college work (at least 30 hours and one year of residence must be completed in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student becomes eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

Combined Master of Science and Doctor of Medicine

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the combined degrees of Master of Science and Doctor of Medicine in the fields of biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to apply for the combined degrees of Master of Science and Doctor of Medicine must meet the requirements for admission to the Graduate School of Arts and Sciences. They must be recommended by the chairman of the department and by the Dean of the Graduate School of Arts and Sciences and the Dean for Academic Affairs of the Medical Center.

The Master of Science degree program consists of a minimum of 30 semester hours, which includes a thesis (equivalent to six semester hours). For a Master of Science degree program that does ***not*** include a thesis, the number of semester hours of graduate course work is determined by the department. The program without the thesis is not an individual student option and is not available in every department.

A maximum of 12 semester hours of credit for graduate-level courses ***completed as a part of the Doctor of Medicine degree*** (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining semester hours of work, including a thesis if it is required, must be in course work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

In cooperation with the Graduate School of Arts and Sciences, a dual program is available to qualified students who seek both the Doctor of Medicine and

Doctor of Philosophy degrees. The requirements that must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the dual-degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. On admission to both schools, the student may apply for affiliation with the dual-degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a departmental doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. degree program of the School of Medicine and Health Sciences toward the total of 72 semester hours required for the Doctor of Philosophy degree. Twenty-four hours must be earned in graduate courses during periods when the student is not obligated to full-time enrollment in the M.D. degree program, that is, during summer sessions, vacation periods, etc. The final 24 semester hours of dissertation research toward the Doctor of Philosophy degree may begin concurrently with the final semester of graduate course work. The estimated time for completion of this dual program is six years.

Master of Science and Doctor of Philosophy Requirements

The detailed requirements for the degrees of Master of Science and Doctor of Philosophy are stated in the *Undergraduate and Graduate Programs Bulletin* of the University, which is available at the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

Regulations for M.D. Candidates

A. General

1. Using the guidelines below, the Educational Planning Committee will periodically determine and report to the Faculty Senate on the appropriateness and number of credits for all courses.

   First and Second Year Courses:

   a. Lecture courses: one semester hour for each hour of lecture time per week per semester, adjusted as appropriate.
   b. Laboratory courses: one semester hour for each two or three hours of laboratory time per week per semester, adjusted if appropriate.

   Third and Fourth Year Courses:

   c. Clinical courses: five semester hours for each four weeks of clerkship; three semester hours for two week clerkships.

2. The minimum academic requirement for the M.D. degree will be the completion of all courses designated by the Faculty Senate to be required, and a passing grade in all courses taken, whether required or not, other than electives in the first and second years.

B. Evaluation of Academic Performance

1. Faculty are responsible for evaluating the performance of students in a meaningful, useful and timely manner.
2. A pre-clinical evaluation form will be used in all first and second-year courses. This form will be prepared in triplicate at the end of each course and distributed as follows: one copy to the Dean for Academic Affairs, to be included in the student's file; one copy to the Department; and one copy to the student.
3. A clinical evaluation form will be used in all third and fourth-year courses. This form will be prepared in triplicate at the end of each clerkship or elective and distributed as follows: one copy to the Dean for Academic Affairs, to be included in the student's file; one copy to the Department; and one to the student. This form shall:
   a) list the attribute being evaluated;
   b) provide for indication of the quality of performance; and
   c) provide space for written comments, which are required.
4. Each Department offering required courses should designate an evaluation coordinator to be in charge of student evaluation.

C. Grades

1. The authority for the assignment of grades rests primarily with academic departments or with interdisciplinary faculty. Exceptions are grades of Incomplete and Withdrawal (see below) which may be assigned only for reasons acceptable to the Dean for Academic Affairs.
2. Departments are responsible for the assignment of grades on a rational, just and unbiased basis.
3. The grading system for all non-required electives will be:

   Pass (P) Fail (F)

   For all required courses and senior electives, the grading system will be:

   Honors (H) In Progress (IP)
   Pass (P) Incomplete (I)
   Fail (F) Withdrawal (W)
   Conditional (CN) Exempt (EX)

4. The following definitions apply:

   Honors (H)

   Those students whose performance in a subject is determined by the concerned department to be of superior quality and who, in addition, have demonstrated at the highest level those qualities of intellectual curiosity, motivation and self-discipline which clearly set them apart from the majority of the group, may be assigned the grade of Honors (H).

   Pass (P)

   All students, with the exception of those defined above, whose performance in a subject at least meets the requirements established by the concerned department, shall be assigned a grade of Pass (P).

   Fail (F)

   Those students whose performance in a subject clearly falls so far below departmental passing standards that limited remedial

work would be inadequate to correct the deficiencies, shall be given a grade of Fail (F).

Conditional (CN)

Those students who do not meet the minimum requirements established by the concerned department but who could reasonably be expected to do so through a limited program of remedial work developed by the department and approved by the Committee on Educational Evaluation, shall be assigned the grade of Conditional (CN).

In Progress (IP)

The notation of IP will be assigned to students in courses which require more than one semester for completion. A grade will be assigned upon completion of the entire course in a subsequent semester.

Incomplete (I)

The notation of I will be assigned when a student fails to complete all the required work in a course for reasons acceptable to the Dean for Academic Affairs. Assignment of an Incomplete requires the prior approval of the Dean for Academic Affairs or his designee on a case-by-case basis. A student in the first and second year may not proceed into the work of the following year until a grade of I has been removed; if not removed, a grade of I will be changed automatically to a grade of F after one year. A student in the third or fourth year must remove a grade of I prior to graduation.

Withdrawal (W)

The notation of W will be assigned only when a student is unable to continue in the course for reasons acceptable to the Dean for Academic Affairs. Such reasons may *not* include scholarship.

Exempt (EX)

The notation of EX will be assigned when a student is excused by a department from taking a required course on the basis that s/he is already proven competent in the subject; or when a student is given credit for passing an equivalent course in another institution.

5. All departments should submit F and CN grades to the Office of the Dean for Academic Affairs as soon as possible after the completion of a course or clerkship.

A grade of F requires that the student repeat the course or an equivalent remedial experience at this or some other institution, approved by the department and the Dean for Academic Affairs prior to proceeding to the work of the following year. Upon completion of the requisite course with a grade of Pass (P) or its equivalent, the student shall be permitted to continue in the M.D. program and the grade of F will be converted to F/P if the passing grade was given by our faculty, or F/EX if the course was taken in another institution. The grade of CN is not a passing grade and must be upgraded prior to the beginning of the next academic year, or in the case of clinical subjects, prior to graduation. Upon certification by the department that the student has attained suitable proficiency in the subject, the student shall be permitted to continue in the M.D. program and the

grade of CN will be converted to CN P. A student may, in lieu of such a program, elect to repeat the course at this or any other institution which is approved by the concerned department. A grade of Pass (P) or better shall then result in conversion of the CN to CN/EX.

Failure to upgrade a CN to CN P or CN EX by one of these procedures within the prescribed period shall result in automatic conversion of the CN to CN/F.

6. As soon as possible after receipt of grades, the Dean for Academic Affairs will inform the Committee on Educational Evaluation of the names of all students receiving grades of F or CN and submit their records to the Committee for evaluation and recommendations.

7. (The process defined below is designed to provide that protection against improper academic evaluation guaranteed by Section 2 B of the Statement of Student Rights and Responsibilities.)

If a student feels an evaluation or grade to be unjust or inaccurate, s/he may, within five (5) days of receiving the grade, appeal to the signer of the evaluation for a hearing, simultaneously notifying the Chairperson of the Department. The signer of the evaluation must respond to the student quickly. Failure of the student to initiate such an appeal within five days indicates acceptance of the grade, unless an extension of the time limit is indicated for extenuating circumstances acceptable to the Associate Dean for Student Affairs. From this point on, the Associate Dean for Student Affairs will monitor the process to assure that it moves forward in a timely manner.

If a student remains dissatisfied, s/he should appeal in writing to the Chairperson of the Department or clinical division promptly for reconsideration of the evaluation. The Chairperson shall conduct a review, consulting as appropriate with other faculty and staff, and informing the student in writing of the Chairperson's determination at the earliest possible time. If the student remains dissatisfied, s/he may appeal in writing to the Associate Dean for Student Affairs. The Associate Dean or his/her designee will attempt to arbitrate by conferring with the student and authorities within the Department. Should that fail to resolve the complaint, the Associate Dean will establish an ad hoc committee to review the complaint. The Committee will consist of four persons, at least one of whom will be a student, and none of the Committee members will be from the department against which a complaint has been registered. The task of the Committee will be to advise the Associate Dean for Student Affairs about (1) whether or not the evaluational or grading procedures used in that particular case were essentially the same as those used for other students in that course; and (2) whether or not there is sufficient evidence of an unjust or erroneous evaluation to warrant referral of the case back to the Department for reassessment of the student's competence. Acting upon the Committee's advice, the Associate Dean will either accept the original grade and or evaluation as valid, or refer the case back to the Department for reevaluation and or grading of the student. The Associate Dean in cooperation with the Department Chairperson will determine an appropriate procedure for reevaluation and or grading of the student. If the student or faculty member chooses to contest further the joint decision of the Chairperson and Associate Dean, or if these two administrators are unable to reach agreement, the Dean for Academ-

ic Affairs will review the situation and render a final decision on a reevaluational process. In every case, authority to evaluate and grade students resides in the academic department.

D. **Academic Dismissal**

1. The Dean for Academic Affairs may dismiss a student for academic reasons on recommendation of the Committee on Educational Evaluation.
2. The Committee on Educational Evaluation will make its recommendations to the Dean for Academic Affairs after careful review, considering the total number of credit hours of CN and F grades in courses and electives (except first and second year electives) attained by the student during the M.D. program. Conditional grades which have been remedied to CN P and failing grades which have been remedied are calculated as conditional and failing grades, except in the case of a student who has been permitted to repeat a semester or a year. In such cases, the initial grades will not be counted for possible dismissal.
3. The following regulations establish the conditions under which Academic Dismissal may be recommended:

   A student a) who received grades of F in required courses totalling 14 or more semester hours in any academic year; or b) who receives grades of CN and F in required courses totalling more than 20 semester hours of work in any academic year; or c) who received grades of F in more than 20 semester hours of required work in the M.D. program; or d) who receives grades of CN and F totalling more than 30 semester hours of required work in the M.D. program; or e) who fails to meet any special requirements previously specified for that student by the Dean for Academic Affairs as a condition for continuation in the program; or f) whose knowledge, competencies and personal characteristics have not achieved, in the judgement of the Committee on Educational Evaluation and the Dean for Academic Affairs, a satisfactory level of development and integration at any stage of training to justify continuing him/her as a reasonable candidate for the M.D. Degree (see also Section F) will be subject to dismissal from the M.D. Degree program.

E. **Irregular Progress**

1. Repetition of a Year

   Upon the advice of the Educational Evaluation Committee, the Dean for Academic Affairs may *require* that a student in academic difficulty repeat a year; or may *permit* a student at risk for dismissal to repeat a year. Requiring repetition of a year would be an option where there was a pattern of academic problems which would be difficult or impossible to remedy before the beginning of the next academic year. Allowing a student to recycle would be an option where the student was subject to dismissal on academic grounds, but showed promise of mastering academic material on an additional attempt, and of proceeding without further major difficulty toward becoming a competent physician.

   A student eligible for promotion may be allowed to repeat a year at his/her own request.

2. Leaves of Absence

   Leaves of absence may be granted at the discretion of the Associate Dean for Student Affairs.

3. Withdrawal from the M.D. Program

   Withdrawal from the M D program is anticipated by the Administration to be permanent. In the event that a student later changes his her mind and wishes to re-enter the program, s he must reapply through the Admissions Committee as any other candidate for medical school.

F. Evaluation of Professional Comportment

(This policy has been reviewed by the University Board of Trustees and established to accommodate the unique curriculum and degree requirements of the Medical Center. Unless the University Provost decides in a particular case to have the case processed under the University Guide to Student Rights and Responsibilities, all cases involving misconduct by M.D. candidates will be processed under these regulations.)

Occasionally, by his her behavior--or pattern of behaviors--a student may raise concern as to his her suitability to continue in the study of medicine. It is impossible to catalogue all behaviors which might raise serious questions as to a student's competence to continue in medical school. A process which is described below has been adopted by the Faculty Senate. It is intended to deal with behaviors which may be unacceptable or dangerous to the public if carried into the practice of medicine.

1. The following steps will be the process for identifying and dealing with students with serious problems relating to professional comportment:

   a. When a problem is perceived, the observer will communicate with the Associate Dean for Student Affairs. If the communication is verbal, it must be confirmed immediately by a signed letter which will be placed in the student's confidential file, which will be located in the Academic Dean's office. Access is restricted to the student under consideration, the Dean for Academic Affairs, and the Associate Assistant Deans for Student Affairs and for Education or their designees and, where appropriate, the Subcommittee on Professional Comportment of the Educational Evaluation Committee. This file will be maintained until the student is awarded the M D. degree, or until s he withdraws, transfers or is dismissed from the University for academic reasons. This file and its contents will be destroyed unless the Committee on Educational Evaluation has acted to make it part of the student's permanent record. In any case in which a student is dismissed from the University for nonacademic reasons, the contents of the file will be preserved permanently as a part of the student's record.

      This process may be initiated by the Committee on Educational Evaluation when it is suspected that academic deficiencies are the result of psychological, medical, or behavioral problems.

   b. The Associate Dean for Student Affairs (or his/her designee) must meet with the student as soon as possible. Options for the Associate Dean would include (but not be limited to):

(1) advising the medical student but taking no further action.

(2) recommending that the student seek professional assistance for personal problems which may be impairing professional performance.

(3) developing additional information through contacts with the student, his or her peers, faculty and or professional consultants. For example, the Associate Dean may, with the student's concurrence, refer the student for medical or psychological evaluation. The charge for such an evaluation would be paid by the School of Medicine and Health Sciences, and the professional consultant would be requested to make a written report for inclusion in the student's confidential file.

(4) Referring the case to the Subcommittee on Professional Comportment. This Committee will consist of two students from the third or fourth year of the M D. degree program and two full time faculty, at least one of whom shall be a member of the Educational Evaluation Committee. No administrative officer, including departmental chairpersons, course coordinators or residency training program directors will be eligible to serve on this Subcommittee. Appointment will be for a term of one year Tenure on the Subcommittee will not exceed three years. The Committee and its chairperson will be named by the chairperson of the Educational Evaluation Committee Students will be chosen from three third year and three fourth years students nominated by the Student Council, the others to be retained as possible alternates. All members of the Subcommittee will have voting privileges and decisions will be made by majority vote with all four members being present. Minutes of the Subcommittee will be kept in the student's confidential file. The chairperson may keep duplicate records for the duration of the review, but these are to be returned to the Dean's Office at the end of the process.

c. If it is sent a case for review, the Subcommittee will be responsible for gathering information from individuals who may include (but not be limited to) the student in question, his/her peers, faculty, the administration of the medical school, and, where deemed appropriate, professional consultants on medical or psychological aspects of the problem. While meetings of the Subcommittee are confidential, the student in question and/or his her counsel may attend information gathering sessions as observers.

d. If the professional evaluation is requested by the Subcommittee, referral wil be made by the Associate Dean for Student Affairs or his her designee. As described in 1b(3) above, the cost of this evaluation would be borne by the School of Medicine and Health Sciences and a written report requested for inclusion in the student's confidential file. In contrast, a recommendation for the student to seek professional assistance would remain the concern of the student and not of the School of Medicine and Health Sciences. No contacts by the School will be made to that professional and the expense will be borne by the student.

e. The Subcommittee will make a disposition regarding each case

referred to it as soon as possible. Possible dispositions would include (but not be limited to) advising the student, referring the student for professional assistance for any medical or psychological problem at his/her expense, recommending modification in the student's academic program, and recommending temporary suspension or permanent dismissal from the M.D. program. Any recommendation for modification in the academic program requires that the case be reviewed by the parent committee. The student and, if s/he wishes, the student's counsel may be present during the presentation of information at such a review.

f. The Subcommittee and/or the parent committee will submit recommendations to the Dean for Academic Affairs or his/her designee.

2. Right of appeal will be as follows: The student will be informed of his/her right to request review by the next higher authority; i.e., the Subcommittee on Professional Comportment, the Educational Evaluation Committee, the Dean for Academic Affairs, and, finally, the Vice President for Medical Affairs.

G. **Academic Dishonesty**

(This policy has been reviewed by the University Board of Trustees and established to accommodate the organizational and committee structure of the Medical Center. In cases of academic dishonesty involving M.D. candidates which may arise from within the Medical Center, this policy will be used instead of the University Policy on Academic Dishonesty adopted August 8, 1977.)

1. The Medical Center community, in order to fulfill its purpose, must assure integrity of behavior in the academic enterprise, establishing and maintaining guidelines as necessary to do so. All members of the community are expected to exhibit honesty in their academic work. Medical students are assumed to be familiar with commonly-understood principles of academic honesty, and with such examples of dishonest behavior as copying answers on examinations, using unauthorized aids to memory in examinations, plagiarizing, presenting papers which were purchased or otherwise acquired as of one's own authorship, and falsifying clinical or research data. They have a special responsibility to learn and observe any special procedures established within the Medical Center to assure integrity of academic behavior. Failure to act in accordance with such procedures will be considered academic dishonesty.

2. All members of the community—students, faculty and staff—have a responsibility to prevent acts of academic dishonesty, or if they have occurred, to note and act upon them and to keep them from recurring.

3. Procedures

The remainder of this statement aims solely at informing members of the medical community of their rights and responsibilities with respect to academic dishonesty.

Reports of incidents of academic dishonesty which come to the attention of faculty members, Medical Center staff or students, are to be made by completion of the form entitled "Charge of Academic Dishonesty," after consultation with the departmental chairperson, course coordinator or director of the service, as appropriate. This form, which identifies the student, describes the nature of the charge,

and includes supporting evidence, should be forwarded to the Dean for Academic Affairs and should remain confidential.

Upon receipt of the form, the Dean for Academic Affairs will meet with the student to discuss the charge and supporting evidence, to present the student with a copy of the charge and with a copy of the "Regulations for M.D. Candidates."

If the accusor, the student and the Dean for Academic Affairs agree on the accuracy of the charges, the fact of this agreement shall be noted by the signatures of all three parties on the form and the case will be referred directly to the Educational Evaluation Committee for recommendation of appropriate sanctions and modification of the academic program if necessary.

If the student or the Dean believes the charge(s) not to be accurate, the case will be referred to the Educational Evaluation Committee for review by the Subcommittee on Professional Comportment. The proceedings of the Subcommittee and or the parent committee shall be conducted as described in Section F 1 b (4) of these regulations.

4. Sanctions

In addition to any other disposition available under Section F, one or more of the following sanctions must be invoked by the Dean for Academic Affairs after considering the recommendation of the Educational Evaluation Committee.

a) Discarding the work product, which might result in an "Incomplete," with the requirement that the student satisfactorily complete compensatory work, or be reevaluated on relevant material

b) A notation of "Dropped from the course for academic dishonesty" to appear on the transcript, to be expunged one year after imposition of the penalty, or upon graduation, whichever occurs first. Such a notation will not contribute to jeopardy for academic dismissal, but would require repetition of the course if the course is required.

c) A notation of "Dropped from the course for academic dishonesty" to appear on the transcript, with the notation appearing permanently on the record. Such a notation will not contribute to jeopardy for academic dismissal; but would require repetition of the course if the course is required.

d) Expulsion of the student from the School of Medicine, with the notation of "Academic Dishonesty" placed on the permanent record.

5. Safeguards During Procedure

Should the review and any appeal procedures not be completed before the date on which grades are submitted by the Department, the grade "Incomplete" will be recorded for the student in that course until the charges have been fully adjudicated. The student will not be prevented from meeting other academic requirements—such as taking Part I of the National Boards Examination or entering into the matching—prior to the imposition of sanctions and completion of all appeals that are to be undertaken. If the student voluntarily withdraws from the institution prior to completion of the review process, the following notation will be placed on his/her transcript:

"Withdrew following accusation of academic dishonesty prior to completion of review and determination."

6. Supplemental Guidelines

All departmental chairpersons, course and clerkship coordinators are responsible for informing faculty and staff members about the foregoing statement. Chairpersons are also responsible for publicizing to their students, faculty and staff any supplemental departmental guidelines for academic honesty appropriate to their discipline.

H. Policy on Promotions and Graduation—Academic Requirements

1. In general, promotion from one year to another—and recommendation to the Faculty Senate for award of the M.D. degree—will be automatic upon achievement of academic requirements. Under exceptional circumstances, when evaluation of personal comportment is pending or completed under procedures described in Section F, promotion or graduation may be postponed, denied or subject to additional requirements set for individual students by the Dean for Academic Affairs.

2. Specific Requirements

   a) Year I to Year II: Successful completion of all required work of the first year, with performance at least at the passing level (see Section A 2). The student may not begin the work of the second year until all deficiences of the first year—that is, failing or conditional grades in required courses—have been satisfactorily remedied.

   b) Year II to Year III: Successful completion of all required work of the second year, with performance at least at the passing level (see Section A 2). In addition, receipt in the Dean's office of scores on Part I of the National Board of Medical Examiners examination. The student may not proceed with the work of the third year until all deficiencies in work of the second year have been satisfactorily remedied.

   c) Year III to Year IV: Successful completion of all required clerkships of the third year with performance at least at the passing level. A student may be permitted to matriculate in the fourth year despite unremedied deficiencies in the third year performance if those deficiencies are to be remedied prior to graduation during time which would otherwise be available to the student as elective time or vacation.

   d) Eligibility for Graduation: Students will be recommended to the Faculty Senate to be awarded the M.D. degree upon completion of the minimum academic requirements described in Section A 2 (completion of all courses designated by the Faculty Senate to be required, and a passing grade in all courses taken, whether required or not, other than electives in the first and second years); and fulfillment of any additional conditions relating to personal comportment imposed by the Dean for Academic Affairs (see Section F).

I. Application for Graduation

Application and fee for graduation must be filed in the office of the Dean for Academic Affairs at the time of registration for the last semester of the fourth year.

J. Presence at Graduation

A candidate is required to be present at the graduation exercise unless written application for graduation *in absentia* is approved by the Dean for Academic Affairs.

Fees and Financial Regulations for M.D. Candidates

The following fees have been established for the 1983–84 academic year.*

Application fee	$ 40.00
Tuition fee, for the academic year for 1st- and 2nd-year medical students	18,750.00
Tuition fee, for the academic year for 3rd- and 4th-year medical students	17,000.00
University Center fee, charged all students (except those granted leave of absence status) each semester	74.00
Late-registration fee, for failure to register within the designated period	
During first week of classes	25.00
During second week of classes	50.00
After second week of classes (if permitted)	100.00
Late payment fee, charged for failure to make payments when due (see *Payment of Fees*, below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see *Payment of Fees*, below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any other reason	15.00
Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Payment of Fees

The annual tuition fee for the academic year is payable in two equal installments on or before registration day for each semester. M.D. students who register during the summer for courses offered in other divisions of the University will be charged the regular summer tuition and other fees. No tuition will be charged M.D. students for medical school clerkships elected by the student during the summer between the second and third years. No additional tuition will be charged third-year students for courses taken anywhere in the University during the summer prior to registration as a fourth-year student. No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees are payable at the Office of the Cashier of the University. Checks should be made payable to George Washington University, with student identification number shown in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Tuition is due and payable in full as described above, but students may sign a deferred payment contract with the Student Accounts Office at the time of registration permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the

*For courses offered in other divisions of the University, the following 1983 Summer Sessions fees apply for each semester hour: Tuition $185.00; University Center fee, $7.00.

remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8% per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available. Tuition is paid in 10 equal installments, beginning in May and ending in February. There are no fees or finance charges associated with this plan for students choosing to use it. Students who would like more information should contact Student Accounts at 801 22nd Street, N.W., Washington, D.C. 20052, (202)676-7350.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more per semester. Under such circumstances the student may be permitted to pay one-half of that amount at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late payment fee and will be subject to the interest charge of 8% per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of the deferred payment contract in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

After entering the course of instruction the student is obligated for the tuition for the full semester. A student registered for medical electives in the summer session between the second and third year is obligated for tuition due at the time of registration for the following fall semester, except that in the case of withdrawal or leave of absence a *pro rata* payment will become due immediately.

Acceptance by the University of a student's fees does not in any way obligate the School of Medicine and Health Sciences to accept the student for any subsequent semester or summer session, and the right is reserved to require the withdrawal of any student whenever, in the interest of the student or the School, the Executive Committee of the Medical Center deems it advisable to do so.

Cost of Textbooks and Student Equipment

It is estimated that the minimum cost of necessary textbooks and student equipment (microscope, drawing materials, glass slides, clinical thermometer, stethoscope, hemocytometer, uniforms, etc.) is approximately as follows: first year, $950; second year, $550; third year, $400 and fourth year, $400. Microscopes must be provided by the student. Rentals are not available from the School.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean. Notification to an instructor is not an acceptable notice.

In authorized withdrawals from the University, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

Withdrawal dated on or before Saturday of the first week of classes	90%
Withdrawal dated on or before Saturday of the third week of classes	75%
Withdrawal dated on or before Saturday of the fifth week of classes	50%
Withdrawal dated after the fifth week of classes	none

Regulations governing student withdrawals as they relate to apartment and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

The following fellowships, scholarships, and loan funds are available to students in the School of Medicine and Health Sciences. Unless otherwise specified, inquiries should be directed to the Financial Aid Office of the Medical Center, George Washington University, 2300 Eye Street, N.W., Washington, D.C. 20037.

Fellowships

Wilbur J. and Edith K. Carr Memorial Fellowship Fund (1965)—By bequest of Edith K. Carr, former trustee of the University. The income from this fund provides fellowships in surgery, medicine, or medical research at the George Washington University Hospital.

Samuel Jordan Graham Fellowship in Surgery (1961)—By bequest, in memory of Judge and Mrs. Graham. The income from this fund, up to $2,000, may be used to assist students who are pursuing postgraduate study or research, preferably in surgery, at the School of Medicine and Health Sciences.

If no individual is conducting such work or deserving of the award, the income may be used to provide one or more scholarships (to cover tuition and other school expenses deemed appropriate) for students in the School of Medicine and Health Sciences. Application should be filed with the Chairman of the Department of Surgery no later than March 1.

Robin Miller Research Fellowship (1953)—A $3,000 fellowship established by bequest of Mrs. Robin Miller for the study of cardiovascular diseases.

Henry Ray Foundation Student Fellowship Grant (1967)—Awarded annually to a student in the School of Medicine and Health Sciences for research in cancer and allied diseases at the George Washington University Clinic.

U.S. Public Health Service Training Grants—Information concerning training grants in the medical sciences fields is available at the Office of the Dean for Academic Affairs of the Medical Center.

Scholarships

Scholarships from University funds are offered to full-time students in the M.D. program on the basis of financial need and scholastic achievement. These awards are made for one academic year at a time and are credited directly to the student's tuition bill. Application forms are available upon request from the Financial Aid Office of the Medical Center. The deadline for submission is April 15.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship—Awarded to a student on the basis of financial need and superior grades. Candidates must be citizens of the United States.

Anna Bartsch Hospital Intern Scholarship (1946)—A partial scholarship established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman intern in the University Hospital.

Dr. Edith SeVille Coale Scholarships (1965)—Provided at the request of Dr. Coale for women in the School of Medicine and Health Sciences. The scholarships are administered by the Zonta Club of Washington. Applications should be made to the Financial Aid Office of the Medical Center no later than December 1.

Joseph Collins Foundation Scholarships (1951)—Available to medical students upon application through the Financial Aid Office of the Medical Center.

Morris H. and Pauline L. Goldenberg Scholarship Fund (1979)—Created by gift of Dr. Morris H. (class of 1929) and Mrs. Pauline L. Goldenberg in memoriam for father and mother, the income from which will be used for needy and deserving medical students in the School of Medicine and Health Sciences. Preference will be given to students expressing an interest in the study of radiology.

The Garfield Kass Memorial Medical Scholarship (1979)—Established by his wife, Rose. Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

Ki-Wives of Washington Scholarship Fund (1958)—Three scholarships available to students in the School of Medicine and Health Sciences.

Sidney A. Levine Scholarship Fund (1971)—Established to assist medical students on the basis of financial need and academic performance.

Medical Student Summer Research Scholarships—For student participation in the research programs of the School of Medicine and Health Sciences or special training in research methods. Research scholarships are ordinarily awarded for full-time activity during the summer months. Scholars are

matched with members of the faculty according to their mutual interests. These programs have been sponsored by the W. T. Gill Foundation.

Thomas M. Peery Scholarship (1974)—Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

Dan Pollin Medical Scholarship Fund (1980)—Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

School of Medicine Scholarship Fund (1968)—Established by gifts of various and anonymous donors to assist medical students.

Dr. and Mrs. A. E. Sommer Medical School Scholarship Fund—By gift of Dr. A. Ellison Sommer, for deserving and needy students.

Gordon Fay Willey Scholarship (1974)—Awarded to students whose parents are U.S. citizens who are or were enlisted personnel, noncommissioned officers, and officers below the grade of Major in the Army or Air Force or Captain in the Navy of the United States.

Winslow Foundation Scholarship (1974)—Available to medical students who are residents of Maryland, the District of Columbia, or North Carolina, on the basis of financial need.

School of Medicine and Health Sciences Scholarship Fund

Scholarship aid is awarded from income on endowments that have been established by gifts from various donors for tuition awards to students in the School of Medicine and Health Sciences. These awards are distributed on the basis of financial need and scholastic achievement. These scholarships are made for one year at a time and are credited directly to the student's tuition bill. Listed below are the endowments that support the School of Medicine Scholarship Fund.

Anna Bartsch Scholarship Fund (1946)—Established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman in the School of Medicine and Health Sciences "of outstanding scholarship, character, and promise, who intends to make the practice of medicine her life profession."

Jack I. Bender Scholarship Fund (1967)—Established by the family of Jack I. Bender as a memorial to their father. Awarded annually to a student on the basis of academic performance and financial need.

Everett Lamont Bradley Scholarship Fund (1954)—By bequest of Alice R. H. Bradley in memory of her son, for a student in the School of Medicine and Health Sciences.

Elma B. Carr Scholarship Fund (1976)—Created from income distribution of the Elma B. Carr, M.D., Trust, the income to be used for scholarships in the School of Medicine and Health Sciences.

Oliver C. Cox Scholarship Fund (1973)—Established in memory of Dr. Oliver C. Cox, "for the establishment, support and maintenance of endowed scholarships in medicine."

Albert A. and Esther C. Jones Scholarship Fund (1981)—To be used to defray expenses, including tuition, room and board, and books of worthy students for the teaching of science or medicine.

Barbara Logan, M.D., Scholarship Fund (1980)—Awarded annually to the third-year student who ranked among the top five students in the class during the first two years and who was experiencing the greatest financial need among those five.

Loughran Medical Scholarship (1976)—A partial scholarship established by the Mary and Daniel Loughran Foundation, Inc., for residents of the Washington metropolitan area. Such residency must have been established prior to the commencement of the recipient's undergraduate studies. Awarded 1978–79 and every third year thereafter.

Medical School Student Financial Assistance Fund (1981)—Established by gifts from various donors to assist needy and deserving students.

David Perry Steinman Memorial Scholarship Fund (1960)—Established by friends and classmates. Awarded annually to a second-year student in the School of Medicine and Health Sciences on the basis of financial need and academic performance.

James J. Whisman Scholarship Fund (1966)—By bequest of James J. Whisman for needy and deserving students in the School of Medicine and Health Sciences.

Columbian Women Scholarship Funds

The Columbian Women Scholarships are awarded to women students on the basis of financial need and scholastic attainment. Candidates must have completed a minimum of 15 hours at this University with a minimum *B* (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than May 15 for the fall semester and January 1 for the spring semester. Scholarship aid is awarded from income of the following endowments:

Estelle M. Corbett Scholarship Fund (1973)—Created by gift of Elma Williams for tuition aid for a medical student.

Jessie Fant Evans Scholarship Fund (1967)—Established by bequest of Jessie Fant Evans, former Trustee of the University, for tuition aid.

Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926)—Established by Elizabeth Wilson, as a memorial to her parents, for tuition aid.

Loan Funds*

Allied Health Students Loan Fund (1977)—Created by the proceeds from the annual Medical School Follies, to be loaned to students.

A.M.A. Medical School Loan Fund (1964)—Created by the American Medical Association, to be loaned to students.

Doreen and Donald Brown Loan Fund—This fund has been established to provide aid to worthy and needy medical students.

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students (1977)—Created by the Morris and Gwendolyn Cafritz Foundation, to be loaned to students.

Carr Loan Fund (1962)—Created by Edith K. Carr, to be loaned to students.

Carroll Memorial Loan Fund (1981)—Created in memory of Dr. James Carroll and George S. H. Carroll, husband and son of Mrs. Marie W. Carroll.

Abraham I. Gimble Medical School Loan Fund (1977)—Created by gift of Dr. Abraham I. Gimble, to be loaned to deserving and needy students.

Katharine Graham Medical School Loan Fund—Created in 1978 by gift of

*See the George Washington University School of Medicine and Health Sciences Financial Aid memo for more complete information

Katharine Graham, to be loaned to deserving and needy students.

Himes Loan Fund (1957)—Created by Joseph H. Himes.

Kellogg Medical School Loan Fund (1942)—Created by the W. K. Kellogg Foundation, to be loaned to students.

Dr. Esther A. Nathanson Memorial Medical Loan Fund (1977)—Created in memory of Esther A. Nathanson, A.B. 1922, M.D. 1925, by her sister, Sadie C. Nathanson, to be loaned to deserving and needy students.

Pfizer Loan Fund (1953)—Created by Charles Pfizer and Company, Inc., to be loaned to students.

School of Medicine Medical Student Loan Fund (1952)—Created by School of Medicine students and augmented by a bequest from the estate of Ethel L. Murray, to be loaned to students.

Strauss Medical School Loan Fund (1975)—Created by gift of Lewis H. Strauss and Mrs. Lewis L. Strauss in memory of Honorable Lewis L. Strauss, to be loaned to students.

Student Council Loan Fund (1977)—Created by the proceeds from the annual Medical School Follies, to be loaned to students.

Sutherland Loan Fund (1941)—Created by gift of Rose L. Sutherland and other donors.

Waller Loan Fund (1973)—Bequest of Helen S. Waller, to be loaned to deserving and needy students.

Janice and George Wasserman Medical Student Loan Fund (1978)—Created by the George Wasserman Foundation, Inc., to be loaned to deserving and needy students.

Wrather Loan Fund (1967)—Created by gift of Mrs. W. E. Wrather in memory of her husband, to be loaned to students.

In addition, financial assistance is available through the following:

Catherine Breen Student Loan Fund (1972)—Established by alumni of the School of Medicine and Health Sciences in honor of Catherine Breen, former Assistant to the Dean of the Medical Center. Available to needy students who are candidates for the degree of Doctor of Medicine. Applications should be made to the George Washington University Medical Alumni Association.

Health Professions Student Loan Program –This fund is available to a full-time student pursuing a course of study leading to the degree of Doctor of Medicine. Interns, residents, students engaged in premedical or other professional training, and students enrolled in programs of study other than those leading to the degree mentioned above are not eligible for these loans.

A candidate must (1) be a citizen of the United States or have such immigration status and personal plans as to indicate an intention to become a permanent resident of the United States, (2) be in "exceptional financial need" according to federal regulations, and (3) be in good standing with the School. Inquiries concerning deadlines and applications should be directed to the Financial Aid Office of the School of Medicine and Health Sciences.

National Direct Student Loan Program—This fund is available for full-time students in good standing with the school in which they are enrolled. Students must be citizens or permanent residents of the United States. All loans from the program are made on the basis of financial need. Applications for medical students are distributed by the Financial Aid Office.

Jessie B. Martin Loan Fund (1967)—Established by friends of Jessie B. Martin, former Editor of Academic Publications at the University. An emergency fund for loans up to $200, repayable in 30–60 days, with interest rate of 7% per annum. Application should be made to the Director of the Office of Student Financial Aid of the University.

Prizes

Janet N. Glasgow Award of Outstanding Achievement, American Medical Women's Association, Inc.—Awarded annually if the student ranking first in the graduating class is a woman.

American Medical Women's Association, Inc., Scholarship Achievement Citation—Awarded annually to those female students who are considered "honor graduates."

CIBA-Geigy Award for Outstanding Community Service—Awarded annually to a member of the sophomore class who has performed laudable extracurricular activity within the community.

Samuel M. and Miriam S. Dodek Award (1967)—Established in memory of Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

Allie S. Freed Award (1957)—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

Walter Freeman Award (1966)—Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

Donald H. Glew Memorial Awards—Awarded annually to the winners of the Beaumont Day Competition in student research.

James Douglas Goddard Award in Pharmacology—Awarded annually to the outstanding sophomore medical student in pharmacology.

Alec Horwitz Award (1959)—Awarded annually to a senior who has demonstrated exceptional proficiency in the field of surgery.

Oscar Benwood Hunter Award (1952)—Established by the George Washington University Medical Society, now known as the George Washington University Medical Alumni Association. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pathology.

Jacobi Medical Society Award (1962)—Established in memory of Dr. Abraham Jacobi, the founder of pediatrics practice in the United States. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

Howard Kane–A.F.A. King Obstetrical Society Award (1937)—Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as Professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

Dr. Harold Lamport Biomedical Research Award—Established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport. Awarded annually to the student writing the best paper on original laboratory investigation in physiology.

Lange Medical Publications Awards—Awarded annually to two members of the graduating class who are considered outstanding. The prize consists of the graduate's choice of four books published by Lange Medical Publications.

Huran W. Lawson Award (1957)—Established by Mrs. Lawson in memory of her husband, who was a distinguished member of the Medical Staff of the University. Presented annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of obstetrics and gynecology.

Lemmon Company Student Award—Awarded annually to a member of the graduating class who has demonstrated outstanding ability in medicine.

Benjamin Manchester Award (1966)—Established by a grateful patient in honor of Dr. Benjamin Manchester, clinical professor of medicine. Awarded annually to a member of the graduating class who has an outstanding record and shows promise of real humanitarianism in the practice of medicine.

C. V. Mosby Book Awards—Awarded annually to three members of the graduating class who are considered outstanding by their classmates. The prize consists of the graduate's choice of a book published by C. V. Mosby Company.

Julius S. Neviaser Award (1956)—Awarded annually to the senior who scores the highest grade in a written examination and clinical aspects of orthopaedic surgery.

John Ordronaux Award (1907)—By bequest, awarded annually to the member of the graduating class who has the highest scholastic standing.

Walter F. Rosenberg Award (1980)—Awarded to the senior medical student who shows the greatest interest, proficiency, and scholastic achievement in dermatology.

Sandoz Award—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of psychiatry.

William G. Schaffhirt Award—By bequest, awarded annually to a senior student for the best original essay or thesis on some medical subject of current public interest.

Upjohn Achievement Award—Awarded annually to a member of the graduating class selected by his or her classmates on the basis of outstanding scholastic and personal achievement.

Honor Societies

Alpha Omega Alpha—National Honor Medical Society. Third- and fourth-year candidates for the M.D. degree meeting the qualifications specified by the constitution of the Society are eligible for election to membership.

William Beaumont Medical Society—Medical students who have performed original research in the life sciences are eligible for membership, based on the submission of an acceptable abstract of the research and election by Society members. Outstanding students present their research findings at the annual Student Research Day. The Society also sponsors guest lectures in medical research and assists students in finding research opportunities within the Medical Center.

Howard Kane–A.F.A. King Obstetrical Society—The 15 third- and fourth-year candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.

Center for Aging Studies and Services

The Center offers opportunities for learning through a multidisciplinary, comprehensive, gerontology/geriatrics program. The program encompasses education, training, research, and direct service activities in the field of aging throughout the University. The Center for Aging Studies and Services is based

in the Department of Health Care Sciences. Its major components in the Medical Center are the programs in Geriatric Medicine and in Gerontology and the Adult and Geriatric Nurse Practitioner Program.

Geriatric Medicine Programs

The geriatric service provides primary care to patients over age 65 in outpatient clinics, specialty clinics, and the emergency room in the Medical Center. Rounds take place daily in the University Hospital and several area nursing homes. In the outpatient geriatric clinics, comprehensive assessment and follow-up of patients' physical and mental health, social and economic status, and ability to carry out the tasks of daily living are coordinated and conducted by a geriatric team consisting of a geriatrician, a primary care resident, a social worker, and a physician assistant or nurse practitioner. Students may develop an area of concentration in geriatrics gerontology through the Center for Aging Studies and Services.

Geriatric content is included in the second-year basic curriculum and in the required course Issues in Health Care (HCS 369). The required primary care clerkship for third-year students includes a rotation on the geriatric service, and electives in clinical geriatrics are available for first-, second-, and fourth-year students.

Program Activities in Gerontology

Gerontology activities within the Center for Aging Studies and Services are made possible through formal and informal linkages with community-based agencies that serve the elderly and with other schools within the University. Both arrangements provide opportunities for students in the Medical Center to expand their knowledge about older persons and develop skills in direct work with the elderly.

Medical students and health practitioner students are encouraged to take part in ongoing service projects or help create new ones through the Community Outreach Program for the Elderly. The field experiences made possible through this program provide students with opportunities to learn through direct service activities in the home and in community-based sites. Service learning activities include needs assessment interviews in the home to identify need for services and follow-up; monitoring and advocacy activities to link elderly persons with needed services that will prevent untimely and inappropriate institutionalization; health talks at senior centers to inform elderly persons about how to care for themselves; work with older persons in community-based service agencies to develop and implement interdisciplinary health, education, and physical fitness programs; and participation in seminars designed to augment field experiences.

In addition to the outreach programs that provide experimental learning in aging, courses with specific focus on aging, offered by several schools in the University, provide opportunities for developing special knowledge in the field of aging.

A Master of Arts with a concentration in gerontology is available through the Graduate School of Arts and Sciences. In addition to the courses under Health Care Sciences (HCS 193, 194) and Psychiatry and Behavorial Sciences (Pchi 417), the following are examples of courses in aging offered by other University departments.

Educ 344 Adult Development and Aging
Educ 353 Counseling Older Persons
Educ 383 Interviewing/Counseling for Human Resource Developers
Gern 201 The Biology of Aging
Gern 205 Public Policy and Aging
Gern 290 Practicum in Gerontology
HSA 235 Human Services Integration
HSA 236 Introduction to Long-Term Care Administration
HSA 237 Managing the Long-Term Care Institution
HSA 255 Issues in Gerontology
Psyc 188 Attitudes Toward Death and Dying
Soc 151–52 Problems of Urban Social Systems
Soc 160 Death and Dying: A Sociological Perspective
Soc 181 Major Social Processes
Soc 254 Seminar: Methods in Social Policy Research
Soc 280 The Sociology of Aging

Adult/Geriatric Nurse Practitioner Program

The Nurse Practitioner Program prepares registered nurses to practice mainly in primary care settings of long-term care facilities. The program consists of two semesters of course work and one semester of clinical experience. For more detail on the curriculum of this program, see the description under Allied Health Programs.



Undergraduate Programs in Allied Health

Programs of study in allied health at the School of Medicine and Health Sciences include disciplines and skills that are allied to medicine in the delivery of health care and health education. The faculty of the School recognizes that modern medical practice requires increasing numbers of nonphysician health care professionals, that such allied health personnel are appropriately educated in an academic health center, and that new roles for health care practitioners require the introduction of new curricula in allied health education.

Current allied health course offerings at the School of Medicine and Health Sciences lead to the degrees of (1) Associate in Science, with a major in one of the following programs—Medical Laboratory Technique,* Nuclear Medicine Technology, and Radiologic Technology;* (2) Bachelor of Science in Health Science;* and (3) Bachelor of Science, with a major in one of the following programs—Medical Technology, Nurse Practitioner, Nursing Anesthesia, Physician Assistant, and Radiologic Sciences and Administration.

Certificates are also awarded to students upon successful completion of all of the requirements in one of the following programs: Medical Technology, Nuclear Medicine Technology (on-campus students only), Nurse Practitioner, Nursing Anesthesia, or Physician Assistant.

Admission

The University reserves the right to refuse admission to any student whose academic record suggests an inability to succeed in college, or who, for any other reason, would not be acceptable as a student. In the selection process, no discrimination is made on the basis of sex, race, color, religion, age, or national or regional origin.

An application for admission to degree candidacy in any of the allied health programs must be accompanied by a nonrefundable $20.00 fee, payable by check or money order to George Washington University. The application fee is waived for GWU Medical Technology students who are applying to the clinical (fourth) year of the program, off-campus military students, and students applying for readmission who were enrolled as degree candidates at the time of their last registration at this University and who have not since registered at any other institution.

Application forms are available upon request from the program to which a student seeks admission, except for the first three years of the Medical Technology program. Such applicants should request forms from the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052. Applicants should refer to the individual program descriptions for the appropriate mailing address and for information on additional prerequisites, supportive documents, and application deadlines, since these vary from program to program. Application forms for **readmission** are

*For off-campus military students only

available from the Office of Allied Health Administration, George Washington University School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037. Completed applications, whether for admission or readmission, must be returned to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052 (off-campus military students should return their forms for **readmission** to the Office of Allied Health Administration).

Admission to Degree Candidacy

The general requirements for admission to allied health degree programs are as follows:

1. Graduates of secondary schools must have a diploma based on an acceptable academic record from an accredited secondary school. Applicants who have not graduated from secondary school must submit evidence that they have earned satisfactory scores on the General Educational Development (GED) High School Level tests.
2. Students who have completed secondary school within two years of the date of their application for degree candidacy and who have not attended any college or university must submit evidence of acceptable scores on the Scholastic Aptitude Test (SAT)* of the College Entrance Examination Board (CEEB); applicants without previous college credit who have completed secondary school more than two years before their date of application will be asked to take other tests during the application process (except for off-campus military students).
3. Students who have completed fewer than 12 semester hours of acceptable course work at an accredited college or university before applying for degree candidacy must submit evidence of a satisfactory secondary school record and of acceptable scores on one of the following tests: SAT, ACT, or College-Level Examination Program (CLEP) (except for off-campus military students).
4. Students who have already completed 12 or more semester hours of acceptable course work at an accredited college or university must demonstrate that they have maintained a cumulative quality-point index of 2.0 in course work; they must be in good standing as to scholarship and conduct and be eligible to return to the academic institution most recently attended in the same semester for which admission is now sought at George Washington University. A student who has been academically dismissed or suspended more than twice is ineligible for consideration for at least five years from the date of the last suspension or dismissal.

Required Credentials

In addition to the general list of required credentials that follows, applicants should refer to the individual program descriptions for information on additional requirements.

1. If applicable, a transcript of secondary school work or, for students who are not graduates of secondary schools, GED scores. Offical transcripts must be

*The SAT is preferred; the American College Testing (ACT) battery scores may, however, be substituted

forwarded directly from the institution attended to the Office of Admissions. A transcript submitted by the student is not acceptable.

2. For applicants who have attended any college, university, or other institution of higher learning, an offical transcript forwarded to the Office of Admissions from the Office of the Registrar at each institution attended, regardless of whether credit was earned or desired.

3. Scores on standardized examinations (SAT, ACT, CLEP, etc.), if required, forwarded by the administering agency directly to the Office of Admissions (except for off-campus military students).

4. Service school records, where applicable.

Advance Tuition Deposit

Upon notification of acceptance, a $100 tuition deposit will be required of all full-time, on-campus undergraduate students. The deposit is credited toward tuition and is not refundable.

Admission as an Unclassified Student

A student who wishes to take individual courses in allied health programs without applying for degree candidacy must apply for admission to the University as an unclassified undergraduate student in the School of Medicine and Health Sciences. The Assistant Dean, in conjunction with the appropriate program director and the chairman of the department offering the course, shall determine whether admission will be granted to unclassified students. Credits earned for courses taken as an unclassified student may be transferred to degree programs at the University provided the courses are applicable to the desired curriculum and the student meets the requirements of the degree program for which application is made and is admitted. Permission to take individual courses, if granted, will be limited to six semester hours per student.

Advanced Standing

Advanced standing may be awarded toward the associate and baccalaureate degrees for appropriate course work completed previously at other academic institutions with a minimum grade of *C*. Advanced standing may also be awarded for nontraditional classroom clinical experience. Students must satisfy the residence requirement for their degree programs.

It is the student's responsibility to request that certified, offical transcripts of all course work taken at other institutions and the results of examinations be sent by the issuing institution or agency directly to the Office of Admissions, George Washington University, 2121 Eye Street, Washington, D.C. 20052. If the applicant has fewer than 12 semester hours of acceptable transfer credit (grades of *C* or better on academic work from an accredited institution) at the time the application is submitted, the applicant's secondary school record must also be sent directly from the school to the Office of Admissions. The University reserves the right to refuse credit for transfer in part or in whole.

Degree candidates who are currently enrolled at this institution must obtain permission from the Office of Allied Health Administration before registering to take examinations or courses at other accredited institutions.

Credit From Institutions of Higher Learning

Allied health degree programs vary in the amount of advanced standing they will award for course work previously completed. Students may obtain further information from the Office of Allied Health Administration.

Credit for Nontraditional Classroom or Clinical Experience

The amount and types of advanced standing credit vary from program to program. Students should check with the Office of Allied Health Administration for further information. Credit may be awarded on the basis of nontraditional classroom or clinical experience, by a combination of any of the methods described below.

Credit From Service Schools—A limited amount of credit may be assigned for selected service school instruction. Current military students must submit a DD Form 295; copies of service school records are not acceptable. Veterans should submit photostatic copies of their discharge papers. Additional credits may be required.

Special Departmental Examinations—A student may, on occasion, be permitted to petition any department to take a special examination covering the subject matter of a specific course. Approval of such a request is not automatically granted; the student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examination will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparation, administration, and grading of the examination.

Credit for College Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations passed with an acceptable score (George Washington University will not assign credit for the CLEP General Examination in English composition; it may be taken as a Subject Examination only). Credit is usually assigned for the Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after taking an equivalent course. Arrangements for taking the examinations are solely the responsibility of the applicant and should be made through the College Board College-Level Examination Program, Box 592, Princeton, N.J. 08541.

Credit for New York State Board of Regents Examination—Applicants for degrees who present proper certification of the award of a degree at the associate level from the New York State Board of Regents may be awarded a maximum of 60 semester hours of advanced standing.

Readmission

Students previously registered in the University who were not registered during the immediately preceding semester (summer sessions excluded) must apply for readmission. Students who were previously registered as unclassified, or who attended one or more institutions of higher learning during their absence from this University and now wish to apply for readmission to their degree program, must have complete official transcripts sent directly to the Office of Admissions at this University from each institution attended (off-campus military students who have attended additional service schools must also submit an updated DD Form 295). Applicants for readmission are evaluated on the basis of regulations currently in effect.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of the last registration at this University and who have not registered at another institution in the interim period.

Students From Foreign Institutions

Required Records

Applicants must request all educational institutions attended to send official credentials listing subjects studied, grades received, examinations taken, and degrees received directly to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052. Certified copies of diplomas and certificates from secondary schools and all colleges and universities attended are required. Records of state examinations and certificates are also needed. All records become the property of the University and cannot be returned.

These documents should be in the language in which the institution maintains its official records. If they are in a language other than English, the copies must be accompanied by an English translation.

Language Tests

Students whose native tongue is not English may be required to take the *Test of English as a Foreign Language* (TOEFL) and have the scores submitted to the Office of Admissions. Students are responsible for making arrangements to take the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08541, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the TOEFL does not constitute application for admission to George Washington University.

The *Bulletin of Information*, obtainable without charge, contains the following: a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052.

In addition to the TOEFL requirement, the Office of Admissions may require an admitted student to take an English Placement Test for Foreign Students prior to registration. The results of this test will determine the courses for which the student will be permitted to register in the proposed program of study.

Naval Reserve Officer Training Corps Program

A Naval Reserve Officer Training Corps (NROTC) unit will be established at George Washington University commencing with the fall semester 1984. The objective of the NROTC unit is to educate prospective officers for the Navy and the Marine Corps. Regular and Reserve commissions as Ensign (Navy) or Second Lieutenant (Marines) are awarded on successful completion of prescribed naval science courses and graduation from the University. A student completing the program and accepting a commission is required to serve on active duty for four years if commissioned as a Regular Officer or three years if commissioned as a Reserve Officer. For further details, see the *School of Engineering and Applied Science Bulletin*.

Regulations for Undergraduate Students in Allied Health Programs

Attendance

A student may attend only those classes for which he or she is registered. Regular attendance is expected; a student may be dropped from any course for undue absence.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of the School of Medicine and Health Sciences may be dismissed from the University.

Grades

Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal. Except for courses that specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a *D* or better was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate department chairman or program director through the Assistant Dean. Whenever a grade has not been assigned, *I* (Incomplete), *IP* (Progress), *W* (Authorized Withdrawal), or *Z* (Unauthorized Withdrawal) will be recorded. *I* indicates that the instructor has received a satisfactory explanation for the student's inability to complete the required work of the course in time to meet the University's deadline to submit grades and that the instructor has been informed of and has approved such reasons before the stated deadline. The grade of *I* may be submitted only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the

work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will result in the student's receiving an *F*. An *I* automatically becomes an *F* one calendar year after the date of the last class meeting in the semester for which the *I* was assigned. *IP* is reserved for courses (e.g., clinical rotations) in which the final date extends beyond the official University deadline for submitting grades.

The Quality-Point Index

Scholarship is computed in terms of the quality-point index (QPI), obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on the student's record in this University. Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses in which *W*, *I*, or *IP* are assigned are not considered in determining the index, except that any course in which an *I* or *IP* has been assigned will be included later, when a formal grade has been recorded. Grades earned at other institutions are not included in computing the QPI.

Dean's Honor List

Students who achieve a QPI of 3.50 or higher in any one semester are placed on the Dean's Honor List for that semester. The list is limited to full-time students registered for a minimum of 12 semester hours.

Probation

A student who has attempted a minimum of 12 semester hours of course work and whose cumulative QPI is below 2.00 will be placed on **academic probation** for the period in which he or she next attempts 12 additional semester hours of work. A student whose QPI in the core curriculum falls below 2.50 in any one semester will receive a warning letter and will not be permitted to graduate unless the QPI is successfully raised to the required minimum level. Students should refer to the individual program descriptions for further information on the core curriculum.

A student whose attendance or conduct has been unsatisfactory may be placed on **disciplinary probation** for the period in which he or she next attempts 12 additional semester hours of work.

Suspension

Any student whose cumulative QPI remains below 2.00 after a 12-semester-hour period of probation will be suspended. A student suspended for poor scholarship may not register for course work, even as an auditor. The student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the Assistant Dean, through the appropriate program director, demonstrating that the student is now better prepared to pursue college-level course work. Any student suspended twice for poor scholarship will not be readmitted after the second suspension.

Dismissal

Any student who has received one or more failing grades in any subject may be recommended for dismissal by the program director. Such recommendation will be reviewed by the Assistant Dean and the Dean for Academic Affairs; at the Dean's discretion, the recommendation may also be reviewed by a faculty committee.

Withdrawal

Withdrawal from a course or from the University requires the approval of the student's advisor, the course instructor, and the office of Allied Health Administration. Permission to withdraw from the University, however, will not be granted to a student who does not have a clear financial record (see *Withdrawals and Refunds*, pp. 59-60). The deadline for withdrawal from a course will fall at the end of the fourth week following general registration each semester (except for off-campus military students).

All charges for courses dropped without the approval of the Assistant Dean must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

Adding Courses

The deadline for adding a course will fall at the end of the second week following general registration each semester.

Changes in Program of Study

Changes Within the School of Medicine and Health Sciences' Allied Health Programs—Students may not substitute one course for another, drop courses (see *Withdrawal*), or change their status from credit to audit or audit to credit without the approval of their advisor, the course instructor, and the Assistant Dean.

Transfer Within the University—Application for transfer to another college, school, or division must be made to the Office of Admissions. A maximum of 30 semester hours earned in the Division of Continuing Education and Summer Sessions may be applied toward a baccalaureate degree in the School of Medicine and Health Sciences.

Credit

Credit is given only after registration for a course and satisfactory completion of the required work or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing

A student who has been admitted to any one of the allied health programs may register as an auditor in a class, with the permission of the instructor and the approval of the faculty advisor and the Assistant Dean. An auditor receives no academic credit and is not required to take active part in the class or to pass examinations. A student who receives permission to audit a course may not repeat it later for credit. The on-campus tuition rate is applied to audited courses.

Balance Sheet

After a student has been admitted and registers in a particular degree program, program coordinators in the Office of Allied Health Administration will issue a balance sheet showing the amount of work completed and the requirements still to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Transcripts of Record

The Office of the Registrar will issue official transcripts of student records on the request of a student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts, and a $.50 fee is charged for each additional transcript.

Continuous Enrollment Procedures

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned to inactive status (see below) by the Office of Allied Health Administration, he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force. A student who plans to attend another institution and apply credit so earned toward graduation from this University must first obtain written approval from the Office of Allied Health Administration.

Leave of Absence

Should a student find it necessary to interrupt active pursuit of the degree, he or she must submit a petition requesting a leave of absence for a specific period of time, generally limited to one calendar year, and a Continuous Enrollment Form to the program director and the Assistant Dean. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in effect. Students are assessed no fees while on leave of absence.

Inactive Status

A student may request permission to be placed on inactive status. A Continuous Enrollment Form for this purpose should be initiated by the student and approved by the program director and the Assistant Dean during the registration period for the semester involved. (Off-campus military students will receive Continuous Enrollment Forms in the mail automatically, provided that they have maintained continuous enrollment at this University.) Such permission, if approved, will maintain a student's enrollment at George Washington University. Inactive status will also allow a student to complete approved course work at another institution and have that credit applied toward his or her remaining degree requirements.

Graduation Requirements

Degrees are conferred in February, May, and September. Graduating allied health students may participate in the School of Medicine and Health Sciences commencement ceremony, held each year in May.

To be recommended for graduation by the faculty, a student must have met the admission requirements of the college or school in which he or she is registered; have completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which he or she is registered; and be free from all indebtedness to the University. Registration, either for course work or for continuous enrollment, is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation Form must be filed and the appropriate fee paid **at the time of registration for the last semester or summer session of the senior or final year** (except for off-campus military students, who pay when they have completed their degree requirements).

Scholarship—The student must meet the scholarship requirements for the particular degree for which he or she is registered.

Curriculum—Minimum curriculum requirements for each degree are given in pages 66–76.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

With Distinction

Students in the allied health programs must have a QPI of 3.50 or higher in all course work completed at this institution to be eligible for a baccalaureate degree conferred with distinction. Students must also have completed at least one-half of the courses required for the degree at this institution.

Certificate Requirements

Certificates will be awarded to those students who successfully complete all of the requirements in one of the following programs: Medical Technology, Nuclear Medicine Technology, Nurse Practitioner, Nursing Anesthesia, or Physician Assistant. In addition to completing all the stated requirements for the certificate, students must be free from all financial indebtedness to the University.

Fees and Financial Regulations for Undergraduate Students in Allied Health Programs

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 1983 summer sessions and the academic year 1983–84.

Tuition Fees*

On campus, each semester hour, not to exceed $3,050.00 per semester	$228.00
Off campus, each semester hour	155.00
Summer Sessions, each semester hour	185.00

University Center Fee

(charged all students registered on campus)

Each semester hour, not to exceed $74.00 per semester	7.00

Additional Course Fees

In certain courses offered by Columbian College of Arts and Sciences, additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions in the *Undergraduate and Graduate Programs Bulletin*. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Residence Hall Fees

(See pages 14–15)

Special Fees and Deposits

Application fee (nonrefundable)	$20.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	200.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period:	
During first week of classes	25.00
During second week of classes	50.00
After second week of classes (if permitted)	100.00
Late-payment fee, for failure to make payments when due (see *Payment of Fees* below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see *Payment of Fees* below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00

*Please check with the office of Allied Health Administration for reduced tuition fees that apply to the Nuclear Medicine Technology, Nurse Practitioner, Nursing Anesthesia, Physician Assistant, and Radiologic Sciences and Administration Programs; to the fourth year of the Medical Technology Program; to degree candidates who have completed the certificate portion of their programs; and to off-campus military students. The annual tuition for the nurse practitioner and physician assistant programs is payable in three equal installments on or before registration for each semester (the Summer Sessions portion of the programs is considered a full regular semester).

Waiver examination to qualify for advanced placement	$5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10.00
Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following: (1) the services of the Student and Alumni Career Services Center; (2) the use of the Melvin Gelman Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *GW Hatchet*, the student newspaper; (6) admission to University debates; and (7) medical attention as described under *Student Health Service*. These privileges terminate when the student withdraws or is dismissed from the University.

Payment of Fees

No student is permitted to complete registration until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. No deferred payment is permitted for the summer sessions, with the exception of full-time students in the Nurse Practitioner and Physician Assistant Programs. Interest at the rate of 8% per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available. Please note that a student will not be eligible to receive his or her certificate in any program until the Office of Allied Health Administration receives notification of clearance from the Student Accounts Office.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will automatically be charged a $15 late-payment fee and will be subject to an interest charge of 8% per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the

*A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period

student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Returned-Check Policy

A student whose check is returned unpaid by the bank for any reason will be charged a returned-check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same penalties and restrictions as for late payment enumerated above.

One-Year Prepaid Tuition Plan

Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1983–84 rate, students choosing this plan would pay $6,050 for two semesters instead of $6,100.

Four-Year Prepaid Tuition Plan

New undergraduate students may elect to pay in advance the total tuition for their full four-year program at the rate applicable to their first year. A payment under this plan for programs beginning with the 1983 fall semester would total $24,400. Refunds to students who do not complete their full four-year programs would be made at the original rate for all remaining full semesters.

Commercial Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs but will be happy to provide guidance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in writing to the Assistant Dean. (Regulations concerning withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes.*) Notification to an instructor is not an acceptable notice (see *Withdrawal*, p. 58).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. **Complete withdrawal from the University**:

Withdrawal dated on or before Saturday of the first week of classes	90%
Withdrawal dated on or before Saturday of the third week of classes	75%
Withdrawal dated on or before Saturday of the fifth week of classes	50%
Withdrawal dated after the fifth week of classes	none

2. **Change in status from full-time to part-time student or for partial withdrawal by a part-time student**—The above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.

3. A student enrolled in a full-time undergraduate program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.

4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given to any student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

For full-time undergraduate students, George Washington University has a program of financial assistance consisting of scholarships, loans, grants, part-time employment, or any combination of these resources. The University participates in the National Direct Student Loan, Supplemental Educational Opportunity Grant, and College Work-Study programs. Financial aid is awarded on the basis of the student's scholastic record, financial need, and qualities of leadership. Complete information concerning financial assistance is available from the Office of Student Financial Aid, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052. Students intending to apply for financial aid should do so at the time they return the completed application form, since all applications for financial aid **must be filed by March 1**, regardless of whether the student has been admitted by that date.



Requirements for the Degree of Associate in Science

The satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; some programs, however, may set the requirements above the minimum. The course work must be distributed as follows:

Human Competence—A minimum of six semester hours in English Composition (Engl 9 or 10 and 11 or 12) or the equivalent, plus a minimum of six semester hours to be selected from course offerings in the humanities, social sciences, or mathematics.*

Core Curriculum (Required Courses)—The core curriculum is dictated by the specific requirements of the individual program. The number of semester hours varies slightly from program to program, but a minimum of 48 semester hours is required for an Associate in Science degree.

Students who plan to pursue a baccalaureate degree are advised to plan their associate degree program so that, where possible, they will satisfy the prerequisites of the degree of their choice.

Scholarship Requirements

A minimum cumulative QPI of 2.00 is required for course work leading to the degree of Associate in Science. A minimum cumulative QPI of 2.50 is required for course work in the core curriculum. (See pp. 56–57 for an explanation of the grading system and the QPI; see individual program descriptions for information on the core curriculum.)

Residence Requirement

A minimum of 18 semester hours of course work in the major must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

Medical Laboratory Technique Program

The program of study leading to the degree of Associate in Science with a major in medical laboratory technique is offered only to off-campus military students.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. Students who do not meet these requirements may be considered for degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work completed in residence at George Washington University, with a minimum QPI of 2.50.

*Mathematics electives vary according to the program. Students should check the individual program descriptions for further information.

Degree Requirements

The satisfactory completion of a minimum of 61 semester hours is required. The course work is to be distributed as follows:

Human Competence—6 semester hours of Engl 9 or 10 and 11 or 12 (or the equivalent) and 6 semester hours of college math or 3 semester hours of college math and a humanities or social science elective.

Core Curriculum (Required Courses)—Path 13, 14, 15a, 15b, 16, 17, 18, 19, 20; Chem 9 (the latter is not included in computing the QPI). This requirement is fulfilled by successful completion of Medical Laboratory Technique School (NEC 8506).

Scholarship Requirements

Students must maintain an overall QPI of 2.50 in the core curriculum courses.

Nuclear Medicine Technology Program

The program of study leading to the degree of Associate in Science with a major in nuclear medicine technology is offered to on-campus students and off-campus military students.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. Applicants must be at least 18 years of age by the time they first register as students in the program. A personal interview and two letters of recommendation from previous instructors, advisors, or employers should accompany the application (except for off-campus military students). Students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work completed in residence at George Washington University with a minimum QPI of 2.50.

Degree Requirements

The satisfactory completion of at least 60 semester hours of course work is required. Anat 115 and Phyl 111, or their equivalents, are prerequisite to all other courses in nuclear medicine technology.

Human Competence—6 semester hours of Engl 9 or 10 and 11 or 12 (or the equivalent), 3 semester hours of social science (general psychology is recommended), and 3 semester hours of humanities.

Core Curriculum (Required Courses)—Rad 43, 44, 55, 56, 57, 58, 59, 65, 66, 72, 75, 81, 82, 93, 94, 98. For off-campus military students, this requirement is fulfilled by successful completion of Nuclear Medicine Technology School (NEC 8416).

Scholarship Requirements

Students must maintain an overall QPI of 2.50 in the core curriculum courses.

Applications

Application forms for on-campus students are available from the Radiologic Allied Health Program, 2300 Eye Street, N.W., Washington, D.C. 20037.

(202)676-3650. The deadline for the return of completed applications is March 1.

Radiologic Technology Program

The program of study leading to the degree of Associate in Science with a major in radiologic technology is offered only to off-campus military students.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. Students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work completed in residence at George Washington University, with a minimum QPI of 2.50.

Degree Requirements

The satisfactory completion of 61 semester hours is required, the course work to be distributed as follows:

Human Competence—6 semester hours of Engl 9 or 10 and 11 or 12 (or the equivalent), 3 semester hours of social science, and 3 semester hours of humanities.

Core Curriculum (Required Courses)—Rad 40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99, 100. This requirement is fulfilled by successful completion of Radiologic Technology School (NEC 8452).

Scholarship Requirements

Students must maintain an overall QPI of 2.50 in the core curriculum courses.

Requirements for the Degree of Bachelor of Science in Health Science

The Bachelor of Science in Health Science degree program is currently offered only to Advanced Hospital Corps off-campus military students.

Degree Requirements

The satisfactory completion of a minimum of 120 semester hours is required for the degree of Bachelor of Science in Health Science, distributed as follows:

Human Competence—30 semester hours: 6 hours in English composition, 3 hours in general psychology, and 21 hours in the humanities and social sciences.

Subject Competence—11 semester hours: HCS 10, 15, and 16 are required, plus an additional 7 semester hours of didactic courses in the biological sciences, physical sciences, and mathematics. This requirement is fulfilled by successful completion of Advanced Hospital Corps School (NEC 8425).

Vocational Competence—72 semester hours: HCS 22, 54, 67, 68, 75, 83, 87, 92, 93, 96, 102, 126, 133, 175, 180 (a corresponding number of credits for approved course work may be substituted for HCS 175 and 180).

Requirements for the Degree of Bachelor of Science

The satisfactory completion of a minimum of 120 semester hours of course work is required for the Bachelor of Science degree; some programs, however, may set the requirements above the minimum. The course work must be distributed as follows:

Human Competence—A minimum of 6 semester hours in English composition (Engl 9 or 10, and 11 or 12 or equivalent) and 24 semester hours to be selected from the following three general areas: humanities, social sciences, and mathematics (algebra, geometry, trigonometry, and calculus only). (Off-campus military baccalaureate candidates may include mathematics in subject competence but not in human competence.)

Subject Competence—A variable number of semester hours of didactic courses related to allied health sciences (see individual program descriptions). This requirement may include the biological, physical, and natural sciences (or mathematics, for off-campus military students only).

Vocational Competence—A variable number of semester hours in vocational competence skills related to the major (see individual program descriptions).

Scholarship Requirements

A minimum cumulative QPI of 2.00 is required for course work in programs leading to the Bachelor of Science degree. A minimum cumulative QPI of 2.50 is required for core curriculum courses. (See pp. 56–57 for explanations of the grading system and the QPI; see individual program descriptions for information on the core curriculum.)

Residence Requirement

A minimum of 30 semester hours of course work in the major must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

Medical Technology Program

The satisfactory completion of 120 semester hours of course work is required for the degree of Bachelor of Science with a major in medical technology.

Residence Requirement

A minimum of 30 semester hours must be spent in residence for the degree of Bachelor of Science with a major in medical technology, including the 12-month medical technology program at the University Hospital in the fourth year (Path 121, 122, 123, 124, 125, 126, 130, 131, 132, and 133).

Curriculum

First Three Years

		Semester Hours
English	Engl 9 or 10 and 11 or 12	6
Humanities	6 semester hours selected from one of the following combinations: Art 31–32, 71–72; Chin 163–64; Clas 71, 72, 108, 113; Engl 51–52, 61–62, 71–72, 191–92; Fren 51–52, 60, 91–92; Ger 51–52, 103–4; Mus 3–4; Phil 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; Rel 9–10, 59–60, 21–22, or 23 and 9; Slav 71, 91–92; Span 51–52, 91–92; SpDr* 45, 49, 133, 143, 144, 165, 166, 192	6
Mathematics	Math 30	3
Science	BiSc 11–12, 111; Micr 129	15
	4 semester hours selected from BiSc 104, 127, 128, 145, 148, 155, 163, 164, 165	4
	Chem 11–12, 22, 50	16
Social Science	6 semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1–2; Hist 71–72, 39–40, 72 and 91, 40 and 91; Jour 71–72, 111 and 115; PSc 1–2; Psyc 1 and 5, 6, 8, 22, or 29; Soc 1 and 2 or Soc 1 and any 100-level sociology course	6
Electives	Nonscience electives	18
	Nonscience or science electives	16
		90

Senior Year

Path 121, 122, 123, 124, 125, 126, 130, 131, 132, 133.

All courses in the senior (clinical) year constitute the core curriculum. Students must maintain a minimum cumulative QPI of 2.50 in these courses in order to graduate.

Admission to the first three years of the baccalaureate degree program with a major in medical technology does not guarantee acceptance into the senior (clinical) year conducted at the University Hospital; George Washington University students, however, are given preference. Each student who wishes to be considered for the senior (clinical) year must apply separately for admission. Academic achievement in the sciences, personal interviews, and letters of recommendation will be used to evaluate candidates for admission to the senior year of study. An overall QPI of 2.00 is required in order to be considered for acceptance into the senior year. Application forms for the first three years of the program are available from the George Washington University Office of Admissions. Applicants for the senior year of study must apply personally to the Director of the Medical Technology Program, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-2945, no later than December 15.

Nurse Practitioner Program

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. Candidates for the degree of Bachelor of Science who are

*On July 1, 1983, the Speech and Drama Department was divided into the following departments: the Communications and Theatre Department (CmTr) and the Speech and Hearing Department (SpHr). Please refer to the *Schedule of Classes* for the correct course prefix and number for these courses.

majoring in the nurse practitioner program must also meet the following prerequisites to be considered for admission:

1. Be a graduate of an accredited school of nursing with an overall QPI of at least 2.00 or the equivalent
2. Be a licensed registered nurse in at least one state, U.S. trust territory, or the District of Columbia
3. Have a minimum of two years' experience in nursing practice in a hospital and/or ambulatory setting

Applicants must submit three letters of recommendation of which at least one must be completed by a supervisor; the remainder may be submitted by present or former instructors or by colleagues who are familiar with the applicant's health-care-related experience.

Preference will be given to applicants who show evidence of having made arrangements to be employed as a nurse practitioner on completion of the program.

Scholarship Requirements

General scholarship requirements are stated on page 69. Candidates for a Bachelor of Science degree who are majoring in the nurse practitioner program must maintain a cumulative QPI of 2.00, with a cumulative QPI of 2.50 in the core curriculum.

Advanced Standing

General provisions for advanced standing are listed on pages 53–54. In addition, students may receive up to 60 semester hours of advanced standing for successful completion of nursing school or courses in the physical, natural, or biological sciences, which are applied toward subject competence. In addition, earned credits from other institutions may be applied toward human competence requirements. No advanced standing, however, will be granted for required courses in the major.

Residence Requirement

A minimum of 45 semester hours of course work in the major must be completed in residence in the School of Medicine and Health Sciences.

Degree Requirements

The satisfactory completion of a minimum of 120 semester hours is required for the degree of Bachelor of Science with a major in the nurse practitioner program. Course work is distributed as follows:

Human Competence—30 semester hours: 6 semester hours in English composition (Engl 9 or 10 and 11 or 12) and 24 semester hours in the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus). HCS 109 and 193 may be included as social science electives.

Subject Competence—45 semester hours of course work in the biological, physical, natural, and nursing sciences.

Vocational Competence (Core Curriculum)—45 semester hours as follows:

Clinical Health Sciences—HCS 125, 134, 137, 140, 142, 143, 144, 145, 147, 194; Anat 115; Micr 128; Path 127, 128; Phar 158; Phyl 111.

Required Clinical Rotations—HCS 153, 154, 157.
Elective Clinical Rotations—Selected from the following: HCS 165, 170, 171, 179, 180.

Applications

Application forms are available from the Nurse Practitioner Program, 1229 25th Street, N.W., Washington, D.C. 20037, (202)676-4276. Completed applications should be returned no later than March 20.

Nursing Anesthesia Program

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. In addition, candidates for the Bachelor of Science degree with a major in nursing anesthesia must fulfill the following prerequisites to be considered for admission:

1. Complete successfully high-school or college-level mathematics (general mathematics or algebra)
2. Complete successfully two semesters of college-level general chemistry (General Chem I and II)
3. Be graduates of a state-approved school of nursing; have completed a minimum of 12 months of practical experience in critical-care nursing
4. Be a licensed registered nurse in at least one state, U.S. trust territory, or the District of Columbia
5. Satisfy the admissions requirements of the school of anesthesia at one of the affiliated hospitals prior to being admitted to the program at the George Washington University

Scholarship Requirements

Students must maintain a cumulative QPI of 2.50 in all nursing anesthesia courses taken in the first two semesters. Any student who does not maintain a 2.50 average may be required to take additional course work in order to obtain a minimum 2.50 average in the 30 hours of the core curriculum.

Advanced Standing

The general provisions for awarding of advanced standing are stated on pages 53–54. In addition, the following specific criteria in the area of subject competence apply to the Bachelor of Science degree with a major in nursing anesthesia:

1. Students who are graduates of two- or three-year nursing school programs and who have had a minimum of 12 months of practical experience in critical-care nursing may receive up to 45 hours of advanced standing credit in Nursing.
2. Students who have earned a B.S. degree in Nursing may receive up to 60 hours of advanced standing credit in Nursing.
3. Certified Registered Nurse Anesthetists will receive credit in Nursing on an individual basis. Students seeking award of advanced standing

credit on the basis of previous anesthesia work experience must demonstrate evidence of clinical competence.

Students who graduated from nursing school more than five years ago and have not been active in nursing during the last five years may be required to take National League of Nursing or New York State Board of Regents examinations.

Residence Requirement

A minimum of 30 semester hours of course work in the major must be completed in residence in the School of Medicine and Health Sciences.

Degree Requirements

The satisfactory completion of a minimum of 120 semester hours is required for the Bachelor of Science degree with a major in nursing anesthesia. Course work is distributed as follows:

Human Competence—30 semester hours: 6 semester hours in English composition (Engl 9 or 10 and 11 or 12), 3 semester hours in psychology, and 21 semester hours in the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).

Subject Competence—30 semester hours of course work in the biological, physical, natural, and nursing sciences.

Vocational Competence—60 semester hours as follows:

Year 1: Phar 21, 22, 110, 111; Anes Phar 191, 195; Anat 115; HCS 134; Phyl 111, Anes 198.

Year 2: Anes 193–94, 195–96.

All students must complete Year 1 (i.e., the core curriculum) in residence, with a minimum cumulative QPI of 2.50. Certified Registered Nurse Anesthetists may waive Year 2 of clinical course work on the basis of successful completion of Year 1 course work, demonstrated clinical competence, and satisfactory completion of an oral and or written examination in the area of clinical anesthesia.

Applications

Application forms are available from the Nursing Anesthesia Program, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-3543. Completed applications must be returned no later than May 15.

Physician Assistant Program

The program leading to the degree of Bachelor of Science with a major in the physician assistant program is offered to on-campus students and off-campus military students and requires the satisfactory completion of 120 semester hours of course work.

Admission Requirements

The general requirements for admission to the program are stated on pages 51–55. In addition, applicants must submit evidence that they have satisfacto-

rily completed a minimum of 30 semester hours of college credit, including two semesters of general chemistry, two semesters of psychology, and two semesters of biological sciences (the latter may include general biology, anatomy, microbiology, or zoology but not botany); completion of one year (2,000 hours) of patient care experience; and three letters of recommendation. A personal interview is also required (not applicable to off-campus military students).

Scholarship Requirements

Scholarship requirements are stated on page 69. Candidates for the degree of Bachelor of Science with a major in the physician assistant program must maintain a cumulative QPI of 2.00 for course work completed in the physician assistant program. A cumulative QPI of 2.50 is required for the courses in the core curriculum (see below).

Students must successfully complete all courses for which they have registered in any one semester before advancing to the next semester (except students in the second year who have received an *IP* for work in progress). Failure to complete satisfactorily any part of the basic science curriculum may result in dismissal from the program. Students whose academic performance falls below average in any course may be required to take additional courses or to complete remedial work successfully before continuing in the program.

Residence Requirement

A minimum of 75 semester hours in the preclinical and clinical portions of the major must be completed in residence at the School of Medicine and Health Sciences.

Advanced Standing

Advanced standing does not apply to courses in the major; advanced standing toward the baccalaureate, however, may be awarded for appropriate course work completed previously at another academic institution with a minimum grade of *C*.

Degree Requirements

Satisfactory completion of a minimum of 120 semester hours is required of students (except off-campus military students) for the Bachelor of Science degree with a major in the physician assistant program. Course work is distributed as follows:

Human Competence—30 semester hours: 6 hours in English composition (Engl 9 or 10 and 11 or 12) and 24 hours of course work selected from the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).

Subject and Vocational Competence—92 semester hours:

Basic Health Sciences—Anat 115; Bioc 111; Micr 128; Path 127, 128, 152; Phar 158; Phyl 111.

Basic Clinical Sciences—HCS 109, 119, 125,* 134,* 137, 140, 145, 146, 147, 148, 151.
Clinical Clerkship—HCS 160,* 163,* 166, 169, 172,* 175,* 178, 198, 199.
Other Required Courses—HCS 113, 116.

Off-Campus Military Students

The Bachelor of Science degree with a major in the physician assistant program is also offered to off-campus military personnel. Military students in the off-campus program must complete the following courses:

Human Competence—30 semester hours: 6 semester hours in English composition and 24 semester hours in the humanities and social sciences.
Subject and Vocational Competence—92 semester hours:

Basic Health Sciences—HCS 111, 120, 121, 151.*
Basic Clinical Sciences—HCS 109, 127,* 128,* 129,* 134,* 137, 146, 147, 148.
Clinical Clerkships—HCS 167,* 169, 172,* 174,* 189, 190, 191, 192, 195, 198.
Other Required Courses—A minimum of 30 semester hours of didactic course work must be completed in the areas of biological and physical sciences. This requirement will be satisfied by successful completion of Advanced Hospital Corps School (NEC 8425) or comparable course work.

Applications

Application forms are available from the Physician Assistant Program, 1229 25th Street, N.W., Washington, D.C. 20037, (202)676-4034, beginning each year in September. Completed applications should be returned no later than the first Monday in February.

Radiologic Sciences and Administration Program

The program leading to the degree of Bachelor of Science with a major in Radiologic Sciences and Administration requires the satisfactory completion of a minimum of 120 semester hours of course work. This program is designed for registered technologists in diagnostic radiologic technology, nuclear medicine technology, ultrasound, or radiation therapy technology who wish to continue their education at the baccalaureate level.

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. In addition, students applying to the program must be registered technologists or registry-eligible within the first academic semester. A personal interview and two letters of recommendation from previous instructors, advisors, or employers should accompany the application.

*Core curriculum course that must be completed with a cumulative QPI of 2.50

Advanced Standing

General provisions for advanced standing are listed on pages 53–54. In addition, students may receive up to 48 semester hours of advanced standing in subject competence under the following conditions:

1. If the student's technical training was completed within the last five years. However, the student must have maintained a QPI of at least 80% from a program in radiologic technology, nuclear medicine technology, or radiation therapy (accredited by the Joint Review Committee on Educational Programs in Radiologic Technology, Nuclear Medicine Technology, or Radiation Therapy of the Council on Medical Education of the American Medical Association).
2. If the student has been certified as an American Registered Technologist, Nuclear Medicine Technologist, or Radiation Therapy Technologist.
3. If the student becomes registry-eligible during his or her first academic semester at George Washington University.

Scholarship Requirements

Scholarship requirements are stated on page 69. Students must maintain a cumulative QPI of 2.50 in the core curriculum (i.e., all courses listed under *Subject and Vocational Competence*).

Residence Requirement

A minimum of 30 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

Degree Requirements

Human Competence—A minimum of 30 semester hours is required, including BAd 102, 105; Engl 9 or 10 and 11 or 12; Psyc 1; Soc 1; 6 hours of social sciences and 6 hours of humanities. Recommended electives include Engl 101, Hum 26; Psyc 151; Soc 129; SpDr* 111, 121.

Subject and Vocational Competence—A total of 92 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association approved program in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology. The remaining 44 semester hours consist of the following required courses:

Radiologic Sciences—CpMd 101; Rad 92, 167, 171, 175, 190, 195.
Radiologic Administration—HSA 142, 153, 154, 170; Psyc 144; Rad 140, 145; Soc 124.

Applications

Application forms are available from the Radiologic Allied Health Program, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-3650, and should be completed and returned no later than March 1 each year.

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*On July 1, 1983, the Speech and Drama Department was divided into the following departments: the Communications and Theatre Department (CmTr) and the Speech and Hearing Department (SpHr). Please refer to the *Schedule of Classes* for the correct course prefix and number for these courses.

Required or Recommended Courses in Allied Health Programs Offered in Other Divisions of the University

Students should consult with their academic advisors on required courses for allied health students offered either by Columbian College of Arts and Sciences or by the School of Government and Business Administration. The program coordinators in the Office of Allied Health Administration will provide assistance in choosing electives appropriate for the student's particular program. These may be selected from a wide array of offerings in the humanities, mathematics, and social sciences. See the University's *Undergraduate and Graduate Programs Bulletin* for a complete list of course descriptions.

Off-campus military students should consult with the program coordinator for assistance in selecting electives and required courses at other institutions.



School of Medicine and Health Sciences Courses of Instruction

The School of Medicine and Health Sciences serves other divisions of the University by making available to nonmedical students certain undergraduate and graduate courses in the following departments: anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. The courses listed represent those offered as of January 1983 and are subject to change. The University reserves the right to withdraw any course announced.

Staff of Instruction

The staff of instruction listed under each department and at the back of this *Bulletin* is current as of July 1982.

Explanation of Course Numbers and Symbols

A number in parentheses after the name of the course indicates the number of semester hours of credit that may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

Courses numbered 1–100 are for first- and second-year undergraduate allied health students. Courses numbered 101–200 are for third- and fourth-year undergraduate allied health students. Courses in the basic science departments numbered 201–400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered 201–400 are primarily for candidates for the M.D. degree.

Key to Abbreviations

The following abbreviations are used for course designations.

Acct	Accounting
AdSc	Administrative Science
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
BAd	Business Administration
Bioc	Biochemistry
BiSc	Biological Sciences
Cart	Cartography
CE	Civil Engineering
CH&D	Child Health and Development
Chem	Chemistry
Chin	Chinese
Clas	Classics
CmTr	Communications and Theatre
CpMd	Computer Medicine
CSci	Computer Science
Derm	Dermatology
EAd	Engineering Administration
Econ	Economics
Educ	Education
EE	Electrical Engineering
EFL	English as a Foreign Language
Engl	English
EnHe	Environmental Health
EngS	Engineering Science
Envr	Environmental Studies
EPol	Education Policy
E&RP	Environmental and Resource Policy
ForS	Forensic Sciences
Fren	French
Geod	Geodesy

Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
Gnet	Genetics
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
HSA	Health Services Administration
Hmn	Experimental Humanities
Idis	Interdisciplinary Courses
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Kor	Korean
Math	Mathematics
ME	Mechanical Engineering
Med	Medicine
Mgt	Management Science
Micr	Microbiology
M&PA	Medical and Public Affairs
MStd	Museum Studies
Mus	Music
Neur	Neurology
NSur	Neurological Surgery
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
Opth	Ophthalmology
OR	Operations Research
Oral	Oral Biology
Orth	Orthopedic Surgery
PAd	Public Administration
Path	Pathology
Pchi	Psychiatry and Behavioral Sciences
PCm	Political Communications
Phar	Pharmacology
Phil	Philosophy
Phyl	Physiology
Phys	Physics
Port	Portuguese
PSc	Political Science
Psyc	Psychology
Rad	Radiology
Rel	Religion
RPol	Regulatory Policy
RSci	Radiological Sciences
Slav	Slavic Languages and Literatures
SLP	Service Learning Program
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpHr	Speech and Hearing
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Policy
Univ	University
Urol	Urology
U&RP	Urban and Regional Planning
WStu	Women's Studies

Anatomy

Chairman: R.S. Snell

Professors: E.N. Albert, F.D. Allan, T.N. Johnson, M.J. Koering, R.S. Snell
Professorial Lecturers: J.L. Angel, M.W. Brightman, T.S. Reese
Associate Professors: K.E. Johnson, D.B. Parsons (*Research*), F.J. Slaby, R.J. Walsh
Associate Professorial Lecturers: J.A. Di Paolo, M.F. Ericksen
Assistant Professors: R.C. Bohn, K.D. Peusner, J.M. Rosenstein

115 **Anatomy for New Health Practitioners** (3) Staff
Gross and microscopic structure of human body, including musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary, and reproductive systems. Laboratory work is limited to prosected anatomical demonstrations.

202 **Gross Anatomy** (6) **Snell and Staff**
For graduate students. Regional dissections of adult cadaver supplemented with lectures and X rays. Laboratory fee, $30. (Fall)

203 **Human Developmental Anatomy** (1) K. Johnson
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Students who have received credit for Anat 204 may not register for Anat 212. Laboratory fee, $13. (Fall)

205 **Human Microscopic Anatomy** (3) Albert and Staff
For graduate students. Microscopic structure of cells, tissues, and organs of human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) Koering
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **Use of Audiovisual Techniques in Anatomy** (2) Allan
For graduate students. Preparation of a significant audiovisual program of some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
For graduate students. Same as Idis 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Laboratory fee, $25

213 **Gross Anatomy** (6) Staff
Required for medical students. (Fall)

214 **Microscopic Anatomy** (3) Staff
Required for medical students. (Fall)

215 **Human Developmental Anatomy** (1) Staff
Required for medical students. (Fall)

221–22 **Seminar** (1–1) Staff
For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and graduate students. Medical students encouraged to attend. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Angel
Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient humans. (Spring)

253 **Brain Tissue Interactions** (1) Walsh and Rosenstein
Lectures on interactions of the central nervous system with muscular, sensory, and endocrine systems. Student presentations and clinical aspects will be included. (Spring) Prerequisite: Idis 212

254 **Fetal Anatomy** (2) Allan
Dissection of the midgestational human fetus. Comparison of fetal and adult structures. 20 students. Laboratory fee for nonmedical students, $10. (Spring)

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Electron Microscopy in Cellular Biology—Laboratory** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25 (Spring)

262 **Gross Anatomy of the Autonomic System** (2) Snell and Staff
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

265 **Clinical Cell Biology and Electron Microscopy** (arr.) Albert
Investigation of clinical problems concerning microwave effects on the nervous system. 4-week elective periods

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell
Detailed dissection, supplemented by X-ray anatomy, discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by X-ray anatomy, discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system, conferences and assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system (Spring)

275 **Advanced Human Embryology** (2) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Prerequisite: Anat 203. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, etc. May be repeated for credit. (Spring)

279 **Applied Regional Anatomy** (arr.) Snell
Regional dissection, guided readings, weekly discussions. 4-week elective periods. (Spring)

282 **Advanced Neuroanatomy** (arr.) T. Johnson
Dissection of the human brain, study of slides of the central nervous system, and an introduction to neurological research. 4-week elective periods.

284 **Applied Surface Anatomy and Radiology** (5) Snell
Detailed study of anatomical structures that are accessible to examination in the living subject, normal radiology of the body. 4-week elective periods. (Spring)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance.

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
Application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment. Approval of instructor required.

291 **Special Projects in Anatomy** (arr.) Snell
Independent study on an aspect of gross anatomy

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Didactic Anatomy** (arr.) Snell
Development of a didactic program to include human developmental anatomy, microscopic anatomy, gross anatomy, and where appropriate, neuroanatomy. Students may also develop interdepartmental opportunities. Topics may include anatomy of the special senses; functional morphology of the endocrine system; structure and functional anatomy of the mammary gland at different ages in both sexes; functional anatomy of the respiratory system, including a study of the bronchopulmonary segments; the urinary system; the heart; the autonomic nervous system, the lymphatic system, the female reproductive system; the male reproductive system, peripheral nerves and peripheral nerve lesions; functional anatomy of bones and joints; the pregnant uterus; the structural and functional anatomy of the stomach, duodenum, and colon. Limited enrollment.

Anesthesiology

Chairman: C.S. Coakley
Associate Chairman: J.E. Zimmerman (Intensive Care Medicine)

Professors: S. Alpert, C.S. Coakley, J.B. Craft, Jr., B.S. Dunbar, B.S. Epstein, M.W. Lichtmann, W.L. Marsh, P. Mazel, G.A. Morales, R.J. Van Houten, H.D. Weintraub, J.E. Zimmerman
Adjunct Professor: J.A. DeKrey
Clinical Professor: L. Bachman
Associate Professors: M.D. Abramowitz, A.H. Altstatt, S.S. Edelstein, A.I Fields, R.S. Hannallah, P.R. Holbrook, M.L.L. Kennedy, W.A. Knaus, D.S. Lee, W.A. McGill II, G.W. Mergner, T.J. Nassif, T.H. Oh, M.J. Shaffer, M.B.G. Shahvari, S.R.P. Watson
Adjunct Associate Professors: D.R. Engelman, R.H. Norton
Associate Clinical Professors: S.N. Albert, H.F. Nicodemus
Assistant Professors: A.S. Anderson, M.J. Becker, L.M. Broadman, D.C. Fones, M.T Karna, R.I. Patel, M.M Pollack, L.G. Welborn
Adjunct Assistant Professors: R.L. Barth, C.C. Yu

Assistant Clinical Professors: C.A. Albert, B.E. Economopoulos, T.G. Rainey
Instructor: R.I. Patel

Courses numbered 190 through 198 are for nursing anesthesia students.

190 **Seminar: Anesthesiology** (4) Staff
Small discussion groups on morbidity and mortality from actual and reported cases. Topics related to complications of anesthesia.

191 **Respiratory Care** (3) Staff
Advanced techniques for the care of patients requiring total prolonged respiratory support.

192 **Orientation for Anesthesia** (0) Staff
Lecture, group discussion, and audiovisual presentation. History of anesthesia, legal aspects, ethics, psychology, professional adjustments, department management, and organization.

193–94 **Methods and Procedures in Anesthesia** (2–2) Staff
At affiliated hospitals. Lecture, group discussion, and audiovisual presentation. Anesthesia techniques, positions in anesthesia, types of anesthetic required to meet the needs of different surgical specialties, and related topics.

195–96 **Principles of Clinical Anesthesia** (13–13) Staff
Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows the patients through their total hospitalization. Designed to satisfy the American Association of Nurse Anesthetists requirements.

197 **Electronics for Medical Personnel** (2) Staff
Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Power, biomedical voltages and transducers, blood pressure and heart rate monitors, displays, telemetry, special-purpose instruments, and safety hazards analysis techniques for technical equipment procurement. (Fall)

198 **Pathological Physiology and Anesthesia** (3) Staff
Review of pathophysiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interactions with anesthetics, and effects on anesthetic management.

210 **Anesthesiology Research Laboratory** (arr.) Mergner
Participation in and observation of the various aspects of laboratory research, including anesthesia, surgery, physiology, pharmacology, and research techniques.

211 **Biomedical Equipment** (1) Shaffer
Overview of diagnostic and therapeutic instrumentation, including cardiovascular, pulmonary, radiology, operating room, and intensive care equipment.

380 **Anesthesiology** (5) Morales
Clinical experience in preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, and monitoring and blood gas determinations. 4-week elective periods. Univ. Hosp.

381 **Cardiovascular Anesthesia** (arr.) Mergner
Clinical experience in the total perioperative evaluation and management of patients with significant cardiovascular disease (open heart, major vascular, or other surgery). Univ. Hosp.

382 **Neurosurgical Anesthesia** (arr.) Lee
Principles of clinical management of the neurologic patient in the perioperative period. Physiology and pharmacology of intracranial pressure and cerebral blood flow and metabolism. Intracranial pressure monitoring and the effects of respiratory nursing, and physiotherapy maneuvers on neuro-

surgical patients. Participation in research projects in operating room and intensive care unit may be involved. Univ. Hosp.

384 **Intensive Care Unit** (5) Zimmerman
Evaluation and management of respiratory failure, rationale and use of automatic ventilators, chronic airway management, cardiovascular support, and intensive care. 4-week elective periods. Univ. Hosp.

386 **Critical Care Medicine** (arr.) Rainey
Participation in managing patients with renal failure, shock, respiratory failure, acid–base disorders, and hyperalimentation. Emphasis is placed on appropriate use of invasive monitoring, intubation, and ventilatory support.

390–92 **Extramural Anesthesiology Elective** (arr.) Morales
The department arranges for students to spend elective periods at other institutions. Interested students should contact Dr. George Morales.

401 **Anesthesiology Emergency Medicine** (arr.) Shesser and Morales
(Same as Idis 401)
Required for all senior medical students. Students spend two weeks on anesthesiology and two weeks on emergency medicine. Exposure to basic physiology and pharmacology as they apply to cardiac, respiratory, obstetric, and renal changes incurred during anesthesia. Students work rotating shifts in the emergency unit of the Medical Center under supervision of faculty and residents of the Division of Emergency Medicine. 4-week elective periods.

Biochemistry

Chairman: A.L. Goldstein

Professors: J.M. Bailey, A.L. Goldstein, B.W. Smith, G.V. Vahouny, G.A Walker
Adjunct Professors: L. Prosky, E.L. Schneider, G.B. Thurman
Clinical Professor: O.I. Dodek, Jr.
Professorial Lecturers: E.P. Anderson, P.H. Fishman, G. Guroff, P.J. Marangos, C.R. Merril, A.N. Schechter, J.C. Smith, Jr., E. Steers, Jr.
Associate Professors: R.W. Bryant, Jr. *(Research)*, L.L. Gallo, A. Kumar, R.E. Lockard *(Research)*, T.L.K. Low *(Research)*
Adjunct Associate Professors: J.N. Ihle, M.M. Zatz
Assistant Professors: G.M. Fiskum, N.R.S. Hall *(Research)*, C.E. Low *(Research)*, W.D. Merritt *(Research)*, T.W. Moody, R.A. Muesing *(Research)*, P.H. Naylor *(Research)*, R.S. Schulof, J.Y. Vanderhoek *(Research)*

101 **Chemistry for Allied Health Science** (2) Trichilo
For allied health students. Basic concepts of general and organic chemistry (Fall)

111 **Biochemistry for Allied Health Science** (3) Walker
For Allied Health students. Basic concepts of biochemistry and their relation to the allied health field. (Fall)

201 **Medical Biochemistry** (8) Walker and Staff
Required for medical students. Lecture and laboratory; emphasis on basic principles and their relation to medicine. (Fall)

205 **Biochemistry of Organ Function** (1) Kramer
For medical students, open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

209 **Research Elective in Medical Biochemistry** (arr.) Walker
For senior medical students. Research in areas currently under investigation in the department. 8-week elective periods. (Fall and spring)

221–22 **General Biochemistry** (3–4) Gallo and Staff
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisites: Chem 152, 154. (Academic year)

225–26 **Introduction to Biochemical Research** (2–4) Smith and Staff
Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used in those units. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Bryant and Vanderhoek
Current literature in biochemistry. Open to graduate students in the biomedical sciences and to a limited number of medical students. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson
Handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff
Directed readings in various areas of enzymology. May be repeated for credit. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Staff
Laws of thermodynamics, application of these laws to biological systems, oxidation–reduction processes, and other special topics. Prerequisite: Bioc 221–22. (Fall)

232 **Protein Chemistry** (2) Steers and Schechter
Theory and methods of protein chemistry, structure–function relationship of proteins, and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

240 **Nutrition** (2) Walker and Staff
Discussion of RDA, nitrogen-balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 **Current Topics in Nutrition** (2) Walker and Staff
Directed literature readings in various areas of nutrition. May be repeated for credit. Prerequisite: Bioc 240.

250 **Cell and Molecular Biology** (2) Kumar and Staff
Organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression, and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

251 **Current Topics in Molecular Biology** (2) Kumar and Staff
Directed readings in molecular biology. May be repeated for credit. Prerequisite: Bioc 250.

252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Irwin and Staff
Biochemical and molecular aspects of selected major diseases. The format will be of a tutorial type, including presentations of material by students. (Spring)

260 **Lipids** (2) Gallo and Vanderhoek
Biosynthesis, metabolism, functions of lipoproteins, prostaglandins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

261 **Current Topics in Lipids** (2) Vahouny and Staff
Directed readings in the area of lipid biochemistry. May be repeated for credit. Prerequisite: Bioc 260.

263 **Biochemistry of the Steroids** (1) Dodek
For medical students; open to a limited number of graduate students. Basic chemistry of the steroids, pathways of biosynthesis and metabolism, regulatory mechanisms, physiologic effects, clinical measurement of endogenous steroids, clinical manifestations of steroid imbalance, steroid changes in pregnancy, and steroid therapy. Prerequisite: Bioc 201 or 221–22. (Spring)

264 **Membrane-Associated Complex Lipids** (1) Fishman
Catabolism and biosynthesis of complex sphingolipids, inherited metabolic diseases associated with malignant transformation, potential roles of gangliosides as membrane receptors for toxins and hormones, and aspects of membrane structure and biochemistry.

270 **Biochemistry of the Immune Response** (2) Goldstein and Staff
Immunoglobulin structure, function, and regulation; complement system; biochemistry of mediators of cellular immunity; molecular biology of the differentiation of the immune system. Prerequisite: Bioc 201 or 221–22. (Spring)

271 **Current Topics in Immunology** (2) Goldstein and Staff
Directed readings in the area of biochemical immunology. May be repeated for credit. Prerequisite: Bioc 270

280 **Biochemistry of Nerve Tissue** (2) Moody and Staff
Molecular structure and function of nerve tissue, intra- and interneuronal communication mechanisms, biochemistry of various brain dysfunctions, and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

290–91 **Extramural Biochemistry Elective** (arr.) Walker
The department arranges for selected students to spend one or more elective periods at other institutions.

295 **Research in Biochemistry** (arr.) Staff
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Readings in Human Nutrition** (arr.) Staff
For senior medical students. Directed readings in human nutrition. (Spring)

502 **Readings in Cell and Molecular Biology** (arr.) Kumar
For senior medical students. Directed readings on current research work in recombinant DNA and the application of gene cloning in the understanding of selected clinical disorders. (Fall and spring)

503 **Readings in Immunology** (3) Goldstein
Assigned readings in immunochemistry, immunobiology, tumor immunology, and basic and clinical cellular immunology. May be repeated for credit. (Spring)

Child Health and Development

Chairman: R.H. Parrott

Associate Chairmen: F.C. Green *(Child Health Advocacy)*, D.W. Delaney *(House Staff and Medical Care)*, A. Einhorn *(Pediatric Medicine)*, L.W. Greenberg *(Student Affairs)*, J.G. Randolph *(Surgical Division)*

Directors of Divisions: L.J. D'Angelo *(Adolescent Medicine)*, R.M. Sly *(Allergy)*, F.C. Green *(Ambulatory Medicine)*, R.S. Chandra *(Anatomical Pathology)*, B.S. Epstein *(Anesthesiology)*, L.P. Scott *(Cardiology)*, F.M. Midgley *(Cardiovascular Surgery)*, J.M. Hicks *(Clinical Laboratories)*, M.L. Elgart *(Dermatology)*, W. Hung *(Endocrinology)*, A. Einhorn *(General Medicine)*, S.L. Leikin *(Hematology)*, G.B. Avery *(Neonatology)*, E. Ruley *(Nephrology)*, S.A. Shelburne, Jr. *(Neurology)*, D. McCullough *(Neurosurgery)*, D.S. Friendly *(Ophthalmology)*, D.W. McKay *(Orthopaedic Surgery)*, K. Grundfast *(Otolaryngology)*, G. Eng *(Physical Medicine)*, J.H. Egan *(Psychiatry)*, W.J. McSweeney *(Radiology)*, J.G. Randolph *(General Surgery)*, A.B. Belman *(Urology)*

Professors: J.P. Adams, G.B. Avery, C.U. Battle, A.B. Belman, R.S. Chandra, R.M. Chanock, C.K. Conners, D.W. Delaney, S.A. Doxiadis *(Visiting)*, B.S. Dunbar, J.H. Egan, A.H. Einhorn, M.L. Elgart, G.D. Eng, B.S. Epstein, D.S. Friendly, F.C. Green, G.R. Herer, J.M.B. Hicks, W. Hung, A.Z. Kapikian *(Research)*, R.B. Kurz, S.L. Leikin, M. Majd, D.W. McKay, W.J. McSweeney, N. Movassaghi, J.D. Noshpitz, J.E. Ott, R.H. Parrott, L.W. Perry, J.G. Randolph, G.C. Rosenquist, L.P. Scott III, S.A. Shelburne, Jr., J.B. Sidbury, Jr., R.M. Sly, P.J. Varghese, J.M. Wiener

Adjunct Professor: A.M. Margileth

Clinical Professors: L. Bachman, S. Berman, A.B. Coleman, L. Cytryn, M. Feitel, S.I. Greenspan, W.A. Howard, J.J. McFarland, I.D. Milowe, B. Olshaker, M.M. Parks, J.L. Rapoport, R.E. Rieger, C.B. Robinowitz, S. Ross, M.F. Shore, J. Spurlock, W. Stark, B.M. Webb, S.I. Wolf

Professorial Lecturers: M.E. Jenkins, J.L. Sever

Associate Professors: M.D. Abramowitz, K.D. Anderson, G.P. August, A.B. Barnet, R.L.O. Boeckx, C.D. Barndt, M.J. Chang, G.J. Cohen, L.J. D'Angelo, M.C. Edwards, C.B. Feinstein, A.I. Fields, A.B. Fletcher, M.A. Fletcher, F.M. Galioto, A.M. Glasgow, L.W. Greenberg, K.M. Grundfast, R.S. Hannallah, P.R. Holbrook, E.J. Kass, H.W. Kim, N.C. Luban, D.B. Magilavy, W.A. McGill II, F.M. Midgley, S.S. Nason, J.W. Oberman, D.W. Ochsenschlager, T.H. Oh, M.N. Ozer *(Research)*, B.M. Potter, G.H. Reaman, W.J. Rodriguez, K.N. Rosenbaum, R.N. Ruckman, E.J. Ruley, S.R. Shapiro, T.J. Silber, L.W. Thompson, J.W.L. Todaro, S.R.P. Watson, I.P. Weiss, K.C. Wells, J.H. Wise, M.R.D. Wolf

Adjunct Associate Professor: R.B. Kielich

Associate Clinical Professors: T.H. Anders, G.A. Balfour, L.M. Beard, P.C. Brunschwyler, J.L. Chamberlain III, G.G. Cochran, R. Evans III, M.J. Fisher, D.J. Fishman, M.S. Glatt, H.R. Gold, V.L. Guandolo, G.W. Hardman, Jr., S.P. Hersh, K.L. Kaplan, C.E.J. Kimball, B.J. Landau, L. Lefkowitz, J.L. Levine, I. Mahdavi, J.R.S. Malkin, A.E. Marans, R.L. McDowell, G.W. Mella, A.J. Modlin, K.B. Nelson, B.H. Ong, F.A. Pedreira, P.T. Peebles, K. Ravenscroft, Jr., M.E. Robinson, R.H. Schwartz, B.C. Straight, T.J. Sullivan, E.S. Taylor, G.A. Tripp, A.R. Ugel

Associate Professorial Lecturer: M. Engel

Assistant Professors: I.S. Baron, E.L. Bartlett, Jr., M.J. Becker, B.B. Bercu *(Research)*, H.J. Bennett, H.W. Binder, A.G. Blouin, G.H. Bock, M.A. Borengasser, D.R. Brallier, L.M. Broadman, R.D. Castro, V.W.C. Cheng, B.A. Copeland, M.R. Eichelberger, T.C. Fearon, R.A. Felter, A.H. Ficker, R.J. Fink, J.E. Fusner, J.L. Gaiter, R.S.K. Gluck, B.G. Gold, P.C. Guzzetta, M.K. Hammock, R.L. Hendren, N.M. Horstmann, V.S. Hubbard *(Research)*, L.S. Jewett, S.H. Josephs, S.P. Kapur, M.T. Karna, J.F. Kelleher, Jr., B.M. Koch, M.G. MacDonald-Ginzburg, M.M. Malawer, B.M. Markle, B.J. Maron *(Research)*, M.K. Miller, G.J. Milmoe, C.R. Mock, T.M. Murphy, S.L. Murray, C.M. Naulty, D.J. O'Donnell, R.I. Patel, K. Patterson, B.J. Peacock, M.M. Pollack, R.B. Reff, C.M. Rogers, J.R. Salcedo-Contreras, B.L. Short, L.F. Sorkin, K.E. Toomey, J.D. Van Brakle, D.C. Watson, Jr., M.I. Weissman, L.G. Welborn, P.H. White

Adjunct Assistant Professor: L.H. Haller

Assistant Clinical Professors: D.G. Albert, M.S. Albert, N. Alcasabas-Yadao, S.C. Amiri, R.S. Bashian, M.C. Bhatia, W.R. Bond, Jr., M.E. Bravo, I. Brook, J.M. Burgin, I.M. Chatoor-Koch, O.P. Chhabra, C.L.C. Chisholm, L.F. Cohen, R.H. Coleman, T.M. Connor, L.A. Cove, G.W. Daisley, Jr., M.W. Datch, M.M. Davis, S.A. DeMuth, M.L. Feldman, M.R.J. Fox, T. Frey, W.A. Fried, A. Gaisin, R.S.K. Gluck, A.E. Gober, H.B. Gould, S.C. Goyal, A.P. Guarinello, H.R. Hagenau, E.J. Hager, D.P. Hamburger, J.H. Hochheiser, J.K. Hurley, G. Joseph, R.A. King, P.C. Latkin, M.E. Lederman, R.P. Lekagul, A.B. Livingood, J.A. Lowe, T.J. Lustberg, H.A. Mangold, D.H. McKnew, Jr., H.M. Meagher, E.S. Meid, J.F. Morales, P.J. Nachajski, J.M. Neander, R.A. Nover, J.F. O'Neill, M.R. Ortega, J.J. Palombi, E.A.G. Pinder, V.E. Powell, J. Raher, C.A. Renschler, R.S. Rixse, C.A.B. Schulman, A.E. Schweitzer, S.A. Shanahan, B.A. Shaver, K.O. Simrel, R.L. Steerman, A.H. Stein, F. Strassburger, A. Tantisunthorn, M.B. Tierney, J.A. Vander Walde, L.A. Vitulano, M.J. Wagner, A.S.K. Werner, R.B. Wertheim, I.C. Williams, S.B.W. Wooten, A.B. Zients, D.M. Zwerdling

Instructors: M.F. Altieri, D.S. Brudno, A.M. Smith

Adjunct Instructor: E.A. Black

Clinical Instructors: S.O. Barr, G.J. Bergman, L.H. Bland, J. Bloom-Feshbach, B.S. Bruner, S.J. Coleman, Jr., P.A. Coyne, R.A. De Vine-Curcio, K.Z. Fowler, J.A. Gingold, E.M. Hall, J.H. Hewitt III, H.L. Kaftarian, S.S. Kessel, G.M. Korengold, D.R. Miller, V.A. Moyer, L.H. Pillsbury, S.E. Ridley, T. Sait, P.C. Sandiford, C.M. Shaer, D.A. Siegel, N. Singh, F.L. Stroud, A.R. Vinitsky, S. White, N.M. Zaldivar

Special Lecturers: J.H. Bayly, C.M. Berlin, J.D. Blake, E.J. Feroli, A.L. Knasel, M.I. Michael, M.I. Mones, E.G. Moses, M. Schuelein, I. Seiler, R.B. Shearin

303 Pediatric Clerkship (10) Greenberg
Required for medical students. Full-time, as part of resident team, ward rounds, work in outpatient department and specialty clinics under staff supervision; child phychiatry and child guidance, lectures, clinical conferences, grand rounds. Children's Hosp. (Annual, continuous 8-week rotation)

360 Clinical Pediatrics Acting Internship: Adolescent Unit (5) Einhorn
4-week elective periods. Children's Hosp.

361 Clinical Pediatrics Acting Internship: Infectious Diseases (5) Einhorn
4-week elective periods. Children's Hosp.

362 **Clinical Pediatrics Acting Internship: General Medicine** (5) — Einhorn
Children aged 2 months–3 years. 4-week elective periods. Children's Hosp.

363 **Clinical Pediatrics Acting Internship: General Pediatrics** (5) — Einhorn
Children aged 3 months–12 years. 4-week elective periods. Children's Hosp.

365 **Clinical Pediatrics Acting Internship** (5) — Van Brakle
Ward and ambulatory services. Lectures, conferences, rounds, 4-week elective periods. Holy Cross Hosp

366 **Mental Retardation** (arr.) — Battle
Review of etiologic factors, clinical manifestations, seizures, disorders, therapeutic and preventive aspects, sociological problems, and restorative and rehabilitative approaches to chronic disease disorder. Participation in a medical care delivery program and three educational programs for the retarded. Hosp. for Sick Children.

367 **Outpatient Pediatrics** (5) — Einhorn
Elective in pediatrics as part of a resident team on an outpatient unit. Children's Hosp

371 **Pediatric Gastroenterology** (5) — Todaro
Inpatient and outpatient management of infants and children with gastrointestinal, pancreatic, and liver diseases. Common procedures performed in gastroenterology (endoscopy, jejunal biopsy, liver biopsy, sigmoidoscopy). 4-week elective periods. Children's Hosp.

373 **Pediatric Urology** (5) — Belman
Participation in clinical approaches on an inpatient and outpatient basis. Assessment, diagnostic evaluation, and participation in surgical problems. 4-week elective periods. Children's Hosp.

374 **Pediatric Orthopaedic Surgery** (5) — Nason
4-week elective periods. Children's Hosp

375 **Pediatric Surgery** (arr.) — Randolph
Participation in closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. Children's Hosp.

376 **Pediatric Neurology** (5) — Shelburne
Active participation in inpatient and outpatient management of children with a variety of neurologic disorders. Experience in the gamut of diagnostic procedures. Participation in regularly scheduled clinical rounds, conferences, and seminars is encouraged. Children's Hosp.

378 **Genetics** (5) — Rosenbaum
Principles of basic human genetics with emphasis on the dysmorphic child, chromosomal aberrations, and genetic counseling. Opportunity to work in the genetic laboratory and to learn chromosomal techniques. 4-week elective periods. Children's Hosp.

379 **Pediatric Intensive Care** (arr.) — Holbrook, Fields, Pollack
Clinical and didactic material on the pathophysiology and treatment of life-threatening illnesses, conditions, or injuries in childhood. Limited patient responsibility, extensive patient contact. Children's Hosp.

380 **Development Disabilities** (arr.) — Battle
Theoretical issues of development, clinical appraisal, and intervention strategies for disability in vision, audition, motor functions, cognition, language, feeling, and affective development. Intensive review of normal development in all areas. Weekly reading assignments, written projects, and tutorial discussion sessions. Hosp. for Sick Children

381 **Pediatric Allergy and Immunology** (5) — Sly, Josephs
Introduction to pediatric allergy and clinical immunology; clinics and wards. Some experience in experimental techniques, pulmonary function testing,

and objective methods of clinical evaluation. Children's Hosp.

382 **Pediatric Radiology** (arr.) McSweeney and Staff
Participation in conferences and observation in the department; conventional and newer nonconventional body imaging techniques are stressed in problem solving in pediatric medicine. Children's Hosp.

383 **Pulmonary Medicine** (arr.) Fink
Detailed diagnostic and therapeutic procedures, including pulmonary and nutritional manifestations and complications in cystic fibrosis patients, from newborns to those in their third decade. Medical, surgical, psychological, and social problems of cystic fibrosis patients and their families. Children's Hosp.

386 **Pediatric Hematology/Oncology** (5) Fusner and Staff
Clinical and laboratory studies of infants and children with hematologic disorders, bone marrow examinations. 4-week elective periods. Children's Hosp.

388 **Newborn Medicine** (arr.) Avery
Observation and participation in the intensive care of infants. 4-week elective periods. Children's Hosp.

389 **Pediatric Cardiology** (5) Scott
Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catheterizations. 4-week elective periods. Children's Hosp

390–95 **Extramural Pediatric Elective** (arr.)
The department makes arrangements for students to spend elective periods at other institutions. Interested students should contact Dr. Arnold Einhorn after they have obtained (1) a letter of approval from the Dean for Academic Affairs, (2) a description of the course or courses to be taken, and (3) a description of the affiliations of the other institution.

396 **Approach to Care of Child with Handicapping Condition (arr.)** Battle
Multidisciplinary approach to care of children with multiple handicaps, developmental delay, and/or chronic illness, in clinical assessments, therapy sessions, and interdisciplinary conferences. Reaction and behaviors of the child, family, and staff are explored. Weekly reading assignment, written projects, and tutorial discussion sessions. Hosp. for Sick Children.

397 **Pediatric Nephrology** (arr.) Bock
Emphasis on clinical pediatric nephrology of inpatients and outpatients. Opportunities for evaluation of new referrals for renal problems and the management of known renal disease in both inpatient and outpatient settings. Experience in hemodialysis is available by special arrangement. Research opportunities are available, but the clinical aspects of the program are stressed. Children's Hosp

398 **Comprehensive Care** (arr.) Oberman
Participation in care of both sick and well children as administered in a comprehensive setting, experience in multidisciplinary approach, cooperative planning with other community agencies. Comprehensive Health Care Clinic/Children's Hosp

399 **Ambulatory Adolescent Medicine** (5) Silber
Outpatient clinic experience in diagnosis and management of adolescent problems, under supervision of senior staff and fellows. Participation in consultative clinics, multidisciplinary interviewing conferences, medical teaching conferences, Adolescent Grand Rounds, and semiweekly conferences with Director of Outpatient Management. Children's Hosp

400 **Pediatric Clinical Laboratory** (5) Hicks
Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. 4-week elective periods. Children's Hosp

401 **Pediatric Otolaryngology** (5) Grundfast
Otoscopic examination of infants and children: management of common middle-ear disorders; evaluation of stridor and airway compromise. Children's Hosp.

403 **Pediatric Rehabilitation** (arr.) Eng
Exposure to acute and chronic disabling disorders in infants and children, with emphasis on normal neuromuscular development and physical examination, especially with respect to posture and movement. Exposure to electrodiagnostic techniques, use of non-M.D. therapists in rehabilitation, and use of applicable physical modalities, including braces and adaptive equipment. Observation of pathologic states referred for treatment. Children's Hosp.

404 **Being an Effective Teacher** (3) Greenberg
Theory of problem solving, learning of preference styles, and interpersonal skills and the way in which they affect teaching. Students assess their own teaching and learning styles, are assigned independent readings, and view videotapes to assess teaching effectiveness. Children's Hosp.

405 **Sports Medicine for Children** (5) Reff
Children's Hosp.

Computer Medicine

Chairman: W.S. Yamamoto

Professor: W.S. Yamamoto
Adjunct Professors: L.E. Lipkin, J.K. Weston
Associate Professors: R.A. Dunn (*Research*), W.A. Knaus, H.F. Orthner
Assistant Professor: H.Z. Pipberger (*Research*)

101 **Practical Computing for New Health Practitioners** (3) Orthner
For students majoring in radiologic science and administration. Familiarization with computer systems, basic terminology, applications programming, and I/O equipment.

201 **Theory of Medicine** (1) Yamamoto
Inquiry into the theoretical constructs implicit in the practice of medicine, with emphasis on decision theory. Other topics include the nature, origin, and organization of medical knowledge, with a focus on statistical reasoning.

352 **Introduction to Interactive Computing** (1) Orthner
Introduction to the Massachusetts General Hospital Utility Medical Programming System (MUMPS) programming environment and data base management system, which allows nonprogrammers to design, establish, and operate interactive data bases that are useful for many research projects.

353 **Medical Computing** (arr.) Yamamoto
Aspects of computer use, including preparation and execution of programs that involve clinical or research applications such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. In most cases the instructor tutors a student in computation applied to a medical topic. The course consists of classroom or laboratory instruction only if two or more students enroll.

354 **Automated Medical Measurement Systems** (5) Chiu
Students work under supervision in a multiphasic screening clinic and

participate in the process of new implementations and in evaluation of the system. Seminar discussions related to clinical practice, preventive medicine, and occupational medicine. 4-week elective periods. Warwick Bldg.

390–91 **Extramural Computer Medicine Elective** (arr.)
The department sponsors fourth-year students spending one or more elective periods at other institutions. Programs must have the prior approval of the department staff.

502 **Mathematical Models and Decision Theory** (3) Yamamoto
Systematic review of mathematical and computational approaches to medical decision analysis and representations of biomedical information. The models will deal with physiological systems in heuristic and decision algorithms and with formulation of medical information for automated diagnosis and prognosis. Students should have some interest or experience in probability and differential equations and will be expected to complete a project involving computers. Warwick Bldg.

Dermatology

Chairman: M.L. Elgart

Professor: M.L. Elgart
Clinical Professors: C.S. Brown, T.P. Nigra
Professorial Lecturer: S.K. Gottlieb
Associate Professors: M. Braun III, M.L.Turner
Adjunct Associate Professor: A. Kornhauser
Associate Clinical Professors: L.J. Eanet, R.A. Katz, D.E. Mitchell, P.L. Repetto, Jr., O.G. Rodman, A.R. Ugel
Assistant Professor: C.M. Myrie
Adjunct Assistant Professor: E.C. De Fabo
Assistant Clinical Professors: S.H. Berk, M. Chadab, L.D. Cutler, R.N. De Angelis, A. Gaisin, H.S. Golomb, D.H. Isaacson, K.S. Korossy, L.H. Miller, A. Neimanis, D.L. Pierson, D.N. Robins
Clinical Instructors: G.H. Fuchs, B.L. Patterson

380 **Dermatology Clinic** (5) Elgart
Conferences, lectures, and attendance at dermatology clinic where patients with wide variety of dermatoses are seen. Diagnosis and treatment of common skin disorders. Dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. 4-week elective periods. Med Fac Assoc

381 **Dermatology Clinic** (5) Mitchell
Same as Derm 380. 4-week elective periods. Group Health.

382 **Dermatology Clinic** (5) Rodman
Same as Derm 380. 4-week elective periods. Walter Reed Army Med. Ctr.

383 **Dermatology Clinic** (5) Neimanis, McCarthy
Same as Derm 380. 4-week elective periods. Andrews AFB Hosp.

385 **Dermatology in General Medicine** (arr.) Nigra
Intensive learning experience in dermatology. Outpatient clinic two mornings a week. Daily rounds on the inpatient and consultation services. Consultations on all patients in hospital. One basic science conference each week. Minimum of three hours of dermatology review slide sessions each week. Advanced reading in dermatology will be scheduled. Supervision by chief resident. Washington Hosp. Center.

386 **Private Office Practices** (arr.) Staff
Dr. Elgart will arrange with various private dermatologists for students to work in a private dermatology office. Arrangements may occasionally be made for an additional student.

390–92 **Extramural Dermatology Elective** (arr.)
The department makes arrangements for students to spend 4-week elective periods at other institutions. Interested students should contact the chairman of the department.

501 **Photobiology** (arr.) **Elgart**
The physics of ultraviolet light, principles of photobiology, therapeutic effects of light, sunburn and protection from light, drug-induced photosensitivity, solar urticaria, polymorphous light eruption, the porphyrias, ultraviolet carcinogenesis, and Psoralin photochemotherapy for psoriasis. Morning lecture; afternoon library research. (Spring)

Health Care Sciences

Chairman: J.E. Ott
Director of Division of Geriatric Medicine: V.A. Portnoi

Professors: P.S. Birnbaum, F.C. Green, R.I. Keimowitz, J.C. LaRosa, J.E. Ott, T.E. Piemme, P.J. Steinglass
Adjunct Professor: M.E. Silverstein
Clinical Professor: A.B. Rosenbaum
Professorial Lecturer: S.F. Fiscina
Associate Professors: S.S. Edelstein, L.G. Pawlson, V.A. Portnoi, R.K. Riegelman, L.I. Sank, R.M.F. Southby, C.T. Spiegel, A.W. Stone, J.M. Wise
Adjunct Associate Professors: R.W. Asay, M.V. Berrett, D.R. Engelman, J.H. Hall III, G.T. Izuno, D.F. Lynch, Jr., F. Mullan, B.J. Owens, J.P. Powell, P.R. Rast, G.R. Ross, H.O. Scharpf
Associate Clinical Professors: M.S. Beinfield, L.C. Ellwood, E.J. Hinman, M.W. Lockett, R.A. Millington, D.L. Sansbury, S.J.N. Sugar
Associate Professorial Lecturers: J.L. Falkson, T.M. Kao
Assistant Professors: H.J. Bennett, B.C. Blatt, W.G. Boren, J.F. Cawley, D.G. Clapp, L.G. Cohen, K.K. Davis, C.A. De Atley, M.S. Donaldson *(Research)*, R.A. Ferreras, D.A. Guida, J.K. Johnson, P.P. Kline, S.L. Lugerner, G.J. Povar, J.J. Reich, W.G. Reisz, R.E. Rosenthal, L.P. Saladino, J.A. Schulman, R.F. Shesser, M.S. Smith, W.A. Stein, H.M. Tape, G.P. Thomas, T.W. Turbiak, M.I. Weissman
Adjunct Assistant Professors: H.J. Beecham III, F.S. Curto, Jr., J.T. Donovan, K.R. Harbert, T.G. Johnson, R.D. Lieberman, W.G. Littman, F.W. Maletz, G.R. Nelmes, J.H. Nicklason, J.R. Pace, D.D. Patel, D.L. Pfeifer, D.H. Rowell, D.A. Sharp, J.H. Shelby, M.R. Silverman, T.J. Singer, K.R. Sorem, R.M. Sweet, R.J. Volpe, J.B. Zelman
Assistant Clinical Professors: D.S. Anderson, B. Ayrunin, R.A. Berenson, T.G. Carlton, G.A. Chapnick, A.M. Classen, N.K. Dysart, Jr., W.R. Ehrmantraut, R.L. Fassett, M.V. Glover, E.F. Gottlieb, A.P. Guarinello, R.D. Handy, J.A. Harman, R.E. Hunt, V.G. Ingram, K.R. Kahn, R.W. Klofkorn, T.B. Kulb, I.G. Kuperschmidt, J.P. Lucas, D.J. Lynn, P.D. Morte, M.O. Murphy, S.B. Nagelberg, M.A. Paske, F.B. Purvis, B.S. Reed, R.F. Sarlin, R.F. Schillaci, L.M. Schoonover, T.A. Schultz, G.M. Schumaik,

H.J. Steinfeld, R.G. Stevenson, Jr., P.A. Thomas, M.J. Wagner, C.J. Winfrey

Assistant Professorial Lecturers: M.N. Hamm, J.M. Jones, S.E.H. Raviv

Adjunct Instructors: D.C. Bailey, M.S. Birmiel, I.S. Bloom, P.S. Chamberlain, D.M. Davidson, C.D. Diaz, C.R. Disparti, C. Dunbar, J.L. Garber, N.J. Getgood, C.A. Griemsman, J.F. Hammer, J.W. Hammond III, N.M. Hoover, R.G. Huth, P.E. Jones, J.E. Klein, E.S. Koenig, N.J.C. Kropp, R.P. Leach, O. Levesque, S.D. Linn, G.H. Luedtke, M.A. Mahar, J.K. McCown, J.M. Morris, R.E. Morsch, W.L. Nyland, D.I. O'Hara, R.A. Painter, J.P. Paternite, G.L. Rebholz, V.R. Reublinger, E.H. Rubino, L.K. Shesser, D.H. Shivers, F.L. Shultz, R.P. Smock, M.D.P. Stahl, D.T. Wallace, D.P. Wildsmith

Clinical Instructors: D.T. Chua, G.A. Logsdon, R.W. Morris, J.A. Noronha, J.C. Noyes, B.J. Winston

Special Lecturers: S.C. Beuttel, A.E. Keen, R.L. Keller-Homayssi, J.B. Laskowski, F.K. Lauber, M.D. Lieberman, S.C. Miller, H.L. Parlette III, E.E. Taylor, D.H. Thompson, G.H. Willis

Courses numbered from 10 through 96 are limited to military personnel in off-campus health sciences programs.

10 **Anatomy and Physiology** (3) Staff
(Formerly 2 credits)
Study of the human body; esteology, arthrology, myology, hematology, immunology; circulatory, respiratory, digestive, endocrine, execretory, nervous and reproductive systems.

11 **Applied Anatomy and Physiology** (4) Staff
Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain; physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth.

15 **Pharmacology and Toxicology** (5) Staff
Medicinal substances used in treating people: pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.

16 **Clinical Laboratory Techniques and Procedures** (3) Staff
Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.

22 **Introduction to Epidemiology** (1) Staff
(Formerly 2 credits)
Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of the communicable diseases.

54 **Techniques in Cardiac Resuscitation** (2) Staff
A two-part course, designed to teach basic cardiac life-support techniques and skills needed in basic life-support instruction training.

67 **Disaster Sanitation** (2) Staff
Survey of nuclear, biological, and chemical hazards; emphasis on detection, personnel protection, and related functions.

68 **Environmental Sanitation** (3) Staff
Study of certain environmental factors that contribute to human health. Food, water, living and working spaces, economics, and pest control.

75 **Dental Fundamentals** (2) Staff
Includes screening dental records, providing oral examinations, identifying radiographs, administering anesthesia, and providing dental, endodontal, and periodontal treatment.

83 **Alcohol and Drug Abuse** (2) Staff
Includes types and magnitude of substance abuse, ethical and medical issues, impact on the family, and treatment.

87 **Surface Radiation Health** (3) Staff
Provides background data on sources of radiation and radiation services and programs available in the Navy.

92 **Medical Material Management** (4) Staff
(Formerly 3 credits)
Material management in the medical facility. Budget and budgeting process, expense operating budget, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medicinals, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements

93 **Health Systems Administration I** (2) Staff
(Formerly 3 credits)
Health systems organization. General office procedures, basic typing methods, standard subject identification codes, filing procedures, records disposal, security of patient information, correspondence, procedural manuals

94 **Health Systems Administration II** (4) Staff
Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision

95 **Records Management** (6) Staff
Public health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis

96 **Clinical Experience** (10) Staff
Supervised experience and research. Application of didactically learned principles to the practical situation

100 **Clinical Medicine Review** (5) Staff
For physician assistant students who have failed to meet the required minimum cumulative QPI average in the core curriculum by the end of the clinical year. Students may petition to take this additional rotation on a one-time-only basis; the rotation will be specifically tailored to meet individual student needs, if permission is granted

101 **Environmental Biostatistics** (3)
Statistical reasoning, collection of data, rates, incidence, and prevalence. Generalization of observations and use of measurement data. For off-campus students.

102 **Food and Water Sanitation** (3) Staff
(Formerly 4 credits)
General characteristics of urban and rural water systems: treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation: processing, storing, and distributing food; supervision and training of food industry personnel.

109 **Human Behavior I** (2) Staff
Prepares student to enter clinical work with a practical knowledge of psychiatry. Mental status examination as a tool of clinical assessment. Development of a basic approach to understanding and working with psychiatric patients. (Fall)

113 **Physician Assistant Seminar II** (2) Staff
PA Seminar II focuses on psychosocial issues that will affect the student as a physician assistant, including abortion, depression, patient education, suicide, stress, and crisis intervention. Reviews such issues as certification, professional practice, legislation, reimbursement, and malpractice. Prerequisite: HCS 119. (Spring)

116 **Medical Terminology** (0) Davies
Autotutorial completed before entering program. Terminology and vocabulary basic to all areas of medical science, hospital service, and allied health specialties.

119 **Physician Assistant Seminar I** (arr.) Staff
Facilitates student's development in the role of physician assistant. Encourages development of communication skills necessary to enhance the humanistic practice of medicine

120 **Biochemistry for Allied Health Sciences** (2) Staff
See Bioc 111. For off-campus students.

122 **Public Health Microbiology** (3)
General applied concepts of microbiology, fundamental immunologic concepts, general principles of virology, development of a surveillance protocol for nosocomial infection. For off-campus students

125 **Manifestations of Disease** (arr.) Staff
Interdisciplinary course that presents the theory of medicine using an organ system approach. Presents clinical findings and pathophysiology for a wide spectrum of diseases. Medical and surgical subspecialties present state-of-the-art information on the diagnosis and management of diseases. Prerequisite: HCS 110, 112; Phyl 111.

126 **Clinical Approach to Diagnosis** (arr.) Staff
Equips the student with the basic skills necessary to recognize clinical symptoms and signs needed to arrive at an informed provisional diagnosis. For off-campus students.

127 **Clinical Medicine I** (arr.) Staff
Provides the student with an introduction to the recognition of the clinical disease state. An intradisciplinary format allows the student to integrate learning through the use of acquired knowledge in the basic sciences. For off-campus students

128 **Clinical Medicine II** (arr.) Staff
Continuation of Clinical Medicine I with emphasis on advanced technology used in diagnosis and complete review of the therapeutic approach. Prerequisite: HCS 127. For off-campus students.

131 **Human Behavior II** (2) Staff
Continuation of HCS 109. Prerequisite: HCS 109. (Spring)

133 **Introduction to Clinical Assessment** (arr.) Staff
Clinical interviewing and physical examination. Designed to permit the student to achieve a beginner's level of clinical competence. For off-campus students.

134 **Clinical Assessment** (arr.) Staff
Provides the student with the necessary information and opportunity to refine and practice skills in patient interviewing and physical examination. Provides the student with the abilities necessary to integrate data obtained from the newer and more sophisticated modes of diagnostic technology. (Fall)

137 **Issues in Health Care** (1) Staff
Focuses on the interface between the individual practitioner-patient interaction and the various forces of society that have a major impact on the practitioner and the patient. The contribution of law, ethics, economics, and government to the health care system will be introduced in lectures and panel discussions and illustrated with case reports. For off-campus students

140 **Clinical–Pathological Correlation** (2) Staff
Introduction to medical problem solving via case presentations. Student learns to correlate pathophysiology with symptom manifestation. The course emphasizes interpretation of historical and physical findings, laboratory

data, and radiographic studies pertinent to the disease under discussion and examines the rationale for particular drug therapies, including an understanding of side-effects and dosage selection. Prerequisite: HCS 116.

142 Nurse Practitioner Seminar I (3) Johnson
Role resocialization and current issues influencing development of the nurse practitioner role. History-taking and communication skills are a major focus.

143 Nurse Practitioner Seminar II (2) Johnson
(Formerly 3 credits)
Continuation of HCS 142

144 Nurse Practitioner Seminar III (3) Johnson
Continuation of HCS 142 and 143.

145 Primary Care and Therapeutics (2) Staff
Introduction to problem solving, management, and treatment of primary care problems in adult medicine. Case presentations are used, as well as weekly presentations of relevant articles researched by the student.

146 Emergency Medical Techniques (1) Staff
Students learn the principles of recognizing, evaluating, and treating the patient with an urgent or emergent problem. Review of signs and symptoms, accompanying physical findings, and methods for diagnosis and treatment of a spectrum of emergent illnesses. The laboratory portion of the course prepares students for the clinical skills or procedures they will perform in their clinical year, including suturing, gowning and gloving, CPR and ACLS certification, cast application, intubation, and catheterization.

147 Introduction to Radiology (1) Staff
Emphasizes principles and language of radiologic imaging, as well as radiologic anatomy. Students begin to develop a systematic approach to radiology and an ability to distinguish normal from abnormal radiological findings.

148 Introduction to Electrocardiography (1) Staff
Fundamentals of electrocardiography and interpretation of basic ECG patterns are stressed. Common errors in taking and reading ECGs are examined. The identification of common normal and abnormal wave patterns is emphasized by reviewing ECGs taken by the students and others. Information about the effects of drugs and electrolyte imbalance on ECG patterns.

151 Clinical Pharmacology (arr.) Staff
Therapeutics presents day-to-day clinical situations for discussion of the appropriate use of medication and various treatment modalities. Dosages, actions, routes of administration, indications, and contraindications are covered. Advantages, disadvantages, and reasons for selecting the drug of choice or an alternative are stressed.

153 Gynecology Outpatient: Nurse Practitioner (arr.) Staff
Required rotation for nurse practitioner students. Management of gynecological problems in ambulatory setting.

154 Clinical Geriatrics (arr.) Johnson
Required rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

157 Primary Care Preceptorship: Nurse Practitioner (arr.) Staff
Six-week required rotation for nurse practitioner students. All aspects of patient management in ambulatory setting.

160 Medical Inpatient (5) Staff
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the medical problems of a patient who has been admitted to the hospital. The student is part of a medical team under the supervision of the medical resident or attending physician. Students are on a regular call status. Attendance is required at all work rounds, lectures, and conferences.

163 **Medical Outpatient** (arr.) Staff
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the various medical problems encountered in the ambulatory setting. Takes place in a primary care setting such as an outpatient clinic, an HMO, or a community health center. Emphasis on differential diagnosis, patient management, and preventive medicine. Students function as part of the health care team under a physician's supervision.

165 **Medical Outpatient: Nurse Practitioner** (arr.) Staff
Rotation for nurse practitioner students, arranged with approval of advisor. Aspects of specialty patient management in ambulatory setting.

166 **Surgical Inpatient** (5) Staff
Six-week rotation in which the student learns to recognize, collect, and integrate information relating to the admitted surgical patient. In-depth experience in the pre- and post-operative management of the surgical patient. Students assist during operative and ward procedures and function as part of the surgical team under a physician's supervision.

167 **Surgical and Emergency Medicine** (arr.) Staff
Same as HCS 178 except that length of course is variable. For off-campus students.

169 **Obstetrics and Gynecology** (arr.) Staff
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the obstetrical and gynecological patient. Exposure to outpatient gynecological problems and inpatient obstetrical practice. Students act as part of the obstetrical gynecological health care team under a physician's supervision

170 **Obstetrics and Gynecology: Nurse Practitioner** (arr.) Staff
Two-week elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

171 **Pediatric Outpatient: Nurse Practitioner** (arr.) Staff
Elective rotation for nurse practitioner students. Ambulatory pediatric practice.

172 **Pediatric Outpatient** (arr.) Staff
Six-week rotation in which the student learns to recognize, collect and integrate information about the medical problems of the pediatric outpatient. Takes place in a pediatric ambulatory setting under the direction of a pediatrician. Normal growth and development, pediatric history and physical examination, and management of common pediatric illnesses are some of the selected topics.

174 **Primary Care** (5) Staff
Required rotation for off-campus allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

175 **Primary Care Preceptorship** (arr.) Staff
Eight-week experience in which the student performs much as a graduate physician assistant in a primary care setting. Appropriate primary care areas include pediatrics, internal medicine, family practice, and emergency medicine.

178 **Emergency Medicine** (5) Staff
Six-week rotation in which the student learns to recognize, collect, and integrate information about the emergency patient. Takes place in an emergency room department in which the student is exposed to the variety of emergency situations through rotating shifts. The student performs as part of the emergency medical team under the supervision of an emergency room physician.

179 **Emergency Medicine: Nurse Practitioner** (arr.) Staff
Rotation for nurse practitioner students. Medical and surgical emergency management problems.

180 **Practicum in Environmental Health** (arr.) Staff
Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences.

181–82 **Introduction to Environmental Science** (3–3)
Water: general characteristics (urban and rural), treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Recognition and control of environmental pollution. Treatment and disposal of human wastes. Food sanitation, processing, storage, and distribution. Effects of major pollutants on people. Radiological safety. For off-campus students.

183 **Introduction to Industrial Hygiene** (3)
Chemical hazards: diseases caused by chemical exposure, toxic dust, metal fumes and vapor, gases and organic compounds. Physical hazards: biological effects of low and high temperatures, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and atmospheric pollution. For off-campus students.

184 **Public Health Organization and Administration** (3)
Public health activities, organization, philosophy, background, and development. Vital statistics, laboratory services, education, nursing, and social services. Administrative considerations, including governmental aspects, fiscal management, personnel factors, and public relations in public health organizations. For off-campus students.

185 **Environmental Impact and the Law** (3)
The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment. For off-campus students

189 **Alcohol Rehabilitation Unit** (3) Staff
Psychological and therapeutic approaches to care and rehabilitation of patients with alcohol-related disturbances

190 **Dermatology** (1)
Clinical assessment of common dermatologic conditions found in the ambulatory care setting. For off-campus students.

191 **Eye, Ear, Nose, and Throat** (3)
Diagnostic and therapeutic approaches to determining the outcomes of disease of the eyes, ears, nose, and throat. For off-campus students.

192 **Orthopaedics** (3)
Diagnosis and treatment of common orthopaedic problems found in the primary care setting. For off-campus students.

194 **Practicum in Gerontology and Geriatric Care** (arr.) Staff
Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. For medical students and for undergraduate and graduate students in the social sciences and Health Services Administration.

195 **Ophthalmology** (2) Staff
Recognizing and managing common ophthalmologic problems; performing thorough ophthalmologic exams (excluding refraction); and providing routine care of the eye.

196 **Issues in American Health Care** (arr.) Povar
Fieldwork combined with academic study of the present American health care system and its problems: cost, quality of care, delivery of care, ethical

issues, health education, consumer issues. Field placements (12–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. Undergraduate students only. (Fall and spring)

197 **Current Topics in Bioethics** (1) Staff
Critical investigation of various problematic areas of bioethics. Designed and presented by an all-campus faculty group that includes physicians, lawyers, economists, philosophers, and health care administrators.

198 **Psychiatry** (arr.) Staff
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the psychiatric patient. The student is part of the therapeutic community and is exposed to the identification, treatment, and therapy of the psychiatric patient.

199 **Independent Study** (arr.) Staff
Required rotation in which the student determines the area of study with the approval of the faculty. Students are expected to develop learning objectives in conjunction with their faculty advisors. Evaluation of the student is based on completion of the learning objectives.

201 **Practicum in Geriatric Care** (1) Pawlson
Clinical experience will include interviewing elderly persons (initial assessment), observation of medical history taking and physical assessment, and participation in a multidisciplinary case conference. (Fall and spring)

202 **Take Care of Yourself** (1) Snodgrass
Interdisciplinary field experience working with the elderly. Weekly 1-hour seminars provide background for teams of medical and HKLS students to conduct, at community-based settings, classes that focus on health education, physical fitness, dance-exercise, and methods of self-care. Students act as health advocates, aiming to foster improved physical, social, and emotional health for elderly persons. Students keep a record of activities and are required to submit a written report on their experience. (Fall and spring)

230 **Emergency Medicine I** (2) De Atley
Required course for first-year medical students. Didactic presentations by guest speakers on general principles in the pre-hospital care and handling of victims of accident and illness. Emphasis on pre-hospital management of typical emergencies. Patient assessment, cardiopulmonary resuscitation, bandaging and splinting, lifts and carries, intravenous therapy and parenteral drug administration. Opportunities to practice psychomotor skills and rescue techniques during regularly scheduled practicum sessions. (Spring)

231 **Emergency Medicine II** (1) De Atley
Elective continuation of HCS 230. The student is expected to develop proficiency equivalent to that of an emergency medical technician. Opportunities to spend time in the University Emergency Room and ride on either a basic life support ambulance or a mobile intensive care unit with the instructor. After successful completion of Emergency Medicine I and II, the student is awarded an Emergency Medical Technician certificate by the University.

232 **Studying a Study: Methods for Reading the Medical Literature** (1) Riegelman
Required course for first-year medical students. Principles of analyzing medical journal articles with application to actual clinical articles. Lectures and seminars stress nonmathematical epidemiology and biostatistical principles with multiple illustrations of errors that can occur in research articles.

301 **Clerkship in Primary Care** (10) Staff
Required for third-year medical students. Care of patients in ambulatory setting. Includes participation in University's prepaid health plan (HMO), emergency room, and office practice of general internists, general pediatricians, and family practitioners. Emphasis on specialty skills that contribute

to physician's capacity to care for common minor illnesses. Office practice of orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Lecture series provides foundation for office management of common illnesses in ambulatory setting. 8-week elective periods throughout the academic year

350 Ambulatory Health Care (arr.) Pawlson
Research or clinical experience in primary medical care, including geriatric medicine. Participation in project relating to health care delivery, including medical audit, study of organization of health services, and problems of underserved (especially elderly) populations. Clinical experience will be arranged. Exchange with similar program in other institutions is possible, especially for those participating in model family practice units.

351 Biomedical Ethics (5) Lynn and Associated Faculty
An intensive course in ethics and related fields offered cooperatively with the medical schools at the Georgetown, Howard, and Uniformed Services Universities. Subjects will be chosen from areas of current tension for the medical professions, including delineation of the physician and patient roles, informed consent, research issues, relation of law and ethics, issues in death and dying, genetic counseling, practitioner's social responsibility, allocation of scarce resources, and federal health policy

352 Clinical Toxicology (arr.) Turbiak
Students work in the National Capital Poison Control Center at Georgetown University Hospital, participate in responding to calls from the public and requests for information from the medical community, and are supervised by the medical director of the poison center. Also included is a series of conferences led by the faculty of the Division of Emergency Medicine.

357 Emergency Medicine in the Suburban Community Hospital (arr.) Shesser
Experience in emergency medicine at a suburban community hospital. Students participate in relevant conferences at Holy Cross and in weekly Emergency Medicine Grand Rounds. 4-week elective periods

358 Emergency Medical Services (3) Adams
Two-week rotation during which students ride with an advanced life support unit of the Emergency Ambulance Service of the District of Columbia. Required readings and a series of lectures presented by the Division of Emergency Medicine.

360 Emergency Health Care (5) Rosenthal
Rotation in emergency medicine under the supervision of the Division of Emergency Medicine. The pre-hospital care module will be incorporated into this course. Washington Hosp. Center

361 Family Practice Preceptorship (arr.) Pawlson
Students spend four to eight weeks in a family practice preceptorship in rural Garrett County. Supervision is by board-certified family practitioners in the Garrett County Medical Center. The physicians are affiliated with the University of Maryland Family Practice Program, of which this site is a part.

362 Rural Family Practice Preceptorship (arr.) Pawlson
Family health care in a small coal mining town in central West Virginia. The Somersville Hospital Family Practice Center includes facilities for outpatient, inpatient, and emergency services. Supervision is by three board-certified family practitioners. 4-week elective periods.

363 Geriatric Medicine (arr.) Pawlson
Clinical experience at a congregate housing facility, outpatient service, hospital home visits, and a long-term facility; opportunity to supplement experience with activity at senior centers and day care facilities.

369 **Issues in Health Care** (1) Povar
Overview of important issues in health care. Lectures focus on broad issues, such as the organization of health care and the role of different professions in the U.S., and on the individual concerns of the patient. Course explores the patient–practitioner relationship and the legal and ethical problems of medical practice. Individual and group projects, seminar discussions, and panel presentations by patients. Required for second-year medical students. (Fall)

390–94 **Extramural Health Care Sciences Elective** (arr.)
The department makes arrangements for students to spend one or more elective periods at other institutions. Approval of the department chairman is required.

395 **Research Elective in Emergency Medicine** (arr.) Kline
Participation in the ongoing research activities of the Division of Emergency Medicine.

502 **Organization and Financing of Health Care in the United States** (3) Birnbaum
Structural and financial policies and forces shaping the current health care delivery milieu in the United States. Students review current issues reflected in the news media to arrive at personal solutions or proposals based on consideration of existing financial and structural characteristics of the health care delivery system. Emphasis is on the organizational provider, although the role of the individual provider is also addressed.

503 **Putting Prevention into Practice—The Prevention and Detection of Medical Mistakes** (3) Riegelman
Presentation of an approach to identifying and anticipating clinical errors in history taking, physical examination, laboratory testing, diagnosis, therapy, and compliance. Clinical examples include obstructive lung disease, diabetes, alcohol-related disease, infectious disease, and cardiology.

Interdisciplinary Courses

First-year medical students are required to take Idis 212, *Neurobiology*, administered by the Departments of Anatomy and Physiology.

212 **Neurobiology** (3) Staff
Same as Anat 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory.

Introduction to Clinical Sciences, an interdisciplinary program, is required of medical students in the second year. By means of lectures, panel discussions, seminars, case presentations, demonstrations, and examinations of patients, it provides students with basic instruction in various clinical subjects and prepares them professionally and personally for the clinical clerkships and career electives in the third and fourth years. The program is under the direction of a Coordinating Committee appointed by the Dean for Academic Affairs of the School of Medicine and Health Sciences and formulated by the Second Year Subcommittee of the Educational Planning Committee. The Coordinating Committee consists of representatives from the departments responsible for teaching courses in the program and medical students: Jerry M. Wiener, Department of Psychiatry and Behavioral Sciences; Frank Miller, Department of Pathology; Gail Povar, Department of Health Care Sciences;

Thomas Piemme, Department of Medicine (Chairman of the Coordinating Committee); John C. LaRosa, Department of Medicine; Samuel Scott, Department of Medicine; Rhonda Goldberg, Office of Education; James Straw, Department of Pharmacology; one second-year student; and one third-year student. In addition to Idis 301 (see below), the program consists of Path 201, Phar 201, Phar 202, HCS 137, and Pchi 201.

301 **Introduction to Clinical Medicine** (16) Staff
One-year course. Integrated, organ-oriented course, with emphasis on physical diagnosis. Fundamental instruction in child health and development, clinical problem solving, dermatology, gynecology, internal medicine (including subspecialties), neurology, obstetrics, ophthalmology, psychiatry, radiology, and urology, hospital-based physical diagnosis and history-taking experience.

401 **Anesthesiology Emergency Medicine** (arr.) Shesser and Morales
(Same as Anes 401)
Required for all senior medical students. Students spend two weeks on anesthesiology and two weeks on emergency medicine. Exposure to basic physiology and pharmacology as they apply to cardiac, respiratory, obstetric, and renal changes incurred during anesthesia. Students work rotating shifts in the emergency unit of the Medical Center under supervision of faculty and residents of the Division of Emergency Medicine. 4-week elective periods.

Medicine

Chairman: J.C. Rios
Directors of Divisions: A.M. Ross *(Cardiology)*, K.L. Becker *(Endocrinology and Metabolic Diseases)*, H.J. Zimmerman *(Gastroenterology)*, L.S. Lessin *(Hematology and Oncology)*, C.U. Tuazon *(Infectious Diseases)*, K. Wipplinger *(Internal Medicine)*, S.V. Spagnolo *(Pulmonary Diseases and Allergy)*, I.G. Tamagna *(Rehabilitation Medicine)*, A.M. Thompson *(Renal Diseases)*, R.P. Jacobs *(Rheumatology)*

Professors: G.A. Alleyne *(Visiting)*, W.P. Baker, W.F. Barth, K.L. Becker, D.O. Castell, T.O. Cheng, M.H. Cohen, J.A. Curtin, V.T. De Vita, M.L. Elgart, G.D. Eng, W.R. Felts, Jr., J.D. Finkelstein, W.P. Fortune, D.E. Hawkins, A.C. Hollinshead *(Research)*, I.I. Hsu, R.P. Kaufman, R.I. Keimowitz, P.D. Kind, N.C. Kramer, J.C. LaRosa, F. Leonard *(Research)*, L.S. Lessin, J. Lindsay, Jr., D.S. O'Leary, A.E. Parrish, T.E. Piemme, L.E. Pierce, H.E. Ratcliffe, R.C. Reba, D. Reiss, J.C. Rios, M.J. Romansky, A.M. Ross, G.P. Schechter, S.V. Spagnolo, I.G. Tamagna, C.U. Tuazon, P.J. Varghese, D.M. Watkin *(Research)*, P. Witorsch, F.W. Wolff, H.J. Zimmerman
Adjunct Professor: W.D. Denckla
Clinical Professors: E. Adelson, A. Baer, L.M. Bernstein, J.B. Calatayud, W.H. Crosby, S.H. Danovitch, H.D. Ecker, M. Fuchs, M. Gusack, H.L. Kamenetz, G.A. Kelser, Jr., S.D. Loube, F.J. Murray, G.H. Nachnani, B. Nelson, E.P. Parker III, J.J. Rheingold, A.B. Rosenbaum, T.S. Sappington, R. Scalettar, C.A. Schulman, H.M. Silver, M.H. Stolar, C.W. Thompson, N.P. Trujillo, M.S. Wolfe, S.J. Wolin
Professorial Lecturers: D.S. Fredrickson, H.A. McAllister, W.C. Roberts, S.G. Sandler
Associate Professors: O. Alabaster, M. Braun III, W.S. Chiu, P. Cohen, L.J.

D'Angelo, D.W. Dew *(Research)*, K.J. Dickie, D.E. Fleischer, B.E. Fossieck, Jr., B.L. Frankel, J.H. Gaskin, A.L. Ginsberg, M.S. Gold, P.A. Gorman, R.P. Jacobs, C.M. Kessler, R.F. Levine, C.W. Linebaugh, D.B. Magilavy, K. Mallik *(Research)*, J.M.B. O'Connell, L.G. Pawlson, T.M. Phillips, V.A. Portnoi, R.K. Riegelman, S.J. Scott, Jr., W.H. Scott, O.L. Silva, C.T. Spiegel, A.W. Stone, A.M.S. Thompson, K. Wipplinger

Adjunct Associate Professors: N.L.H. Gerber, E.A. Jones, W.W. Karney, J.S. MacDonald

Associate Clinical Professors: B. Arling, W.O. Bailey, Jr., L.F. Barker, S.E. Barr, W.I. Bauer, G.S. Belaval, R.B. Benedict, W.D. Brill, P.P.L. Chang, A.W. Danish, O.W. Donnelly, D. Ein, M. Enders, R. Evans III, R.A. Fischer, B.J. Gershen, K. Goldstein, R.A. Goldstein, A.H. Grollman, A. Guha, R. Haider, B.A. Heckman, M. Hershkowitz, P.V. Holland, W.S. Hughes, S.K. Irani, M.H. Jacobson, J.A. Kark, R.M. Kaufman, J.D.B. King, J. Kleh, A.A. Lear, A.G. Levy, J.F. Mermel, J.F. Meyer, H.S. Mirsky, A.M. Mondzac, H.A. Moscovitz, M.A. Newman, D.A. O'Kieffe, J.M. Pisani, J.S. Putnam, D.R. Rosing, C. Rudzki, A. Ruskin, H.C. Sadin, R.K. Sarin, P. Schlein, A. Segal, S.F. Seides, A. Seltzer, J.R. Shapiro, D.B. Simon, B. Slosberg, R.B.W. Smith, S.J. Talpers, I.N. Tublin, H. Weiss, L.M. Weiss, G.R. Werth, E.E. Westura, R.S. Wilkinson, L.A. Wisneski, D. Yoo

Assistant Professors: A.N. Amigable, A.A. Arabian, J. Ardizonne, B.C. Blatt, L.D. Bohan, D.G. Borenstein, G.B. Bren, A.B. Claunch, L.G. Cohen, K.K. Davis, M.D. Delaney, S. Dosa, M.J. Drass, P.B. Ferrell, R.A. Ferreras, E.C. Flores, D.F. Fragnul, H.N. Friedman, A.G.S. Fry *(Research)*, D.B. Gail *(Research)*, B.N. Garrett, L.P. Georges, C.E. Horn, R.J. Katz, N. Kirmani, L.Y. Korman, C.A. Kramer, S.H. Krasnow, W. Kurland, T.V. Kuzmowych, R.H. Leiboff, C.S. Levy, J.H. Lewis, S.L. Lugerner, A.E. Medinger, S.H. Mendelson, R.A. Muesing *(Research)*, L.H. Pierce, Jr., G.J. Povar, R.E. Ratner; R.G. Robinson, P.K. Rohatgi, L.P. Saladino, R.C. Saunders, R.S. Schulof, R.F. Shesser, G.L. Simon, M.S. Smith, L.F. Sorkin, W.M. Steinberg, L.E. Swanberg, H.M. Tape, R.J. Warchol, A.G. Wasserman, P.H. White

Adjunct Assistant Professors: S.M. Butcher, B.R. Kressel, J.W. Long, C.J. Shuman

Assistant Clinical Professors: C.B. Abrams, I.H. Ardam, P. Assatourians, S.M. Babin, H.S.B. Baraf, E.A. Beeman, L.F. Bentolila, R.A. Berenson, S.H. Berk, L.H. Biben, C.J. Bier, B.L. Burka, K.H. Chase, B.I. Choi, F. Chucker, M.I. Cinnamon, R.F. Cioffi, N.B. Cirillo, B.S. Cooper, R. Copperman, N.A. Crane, J. Crowell, G.B. Cushner, K.K. Davis, R.A. Di Giona, D.B. Doman, T.P. Dwyer, R.F. Dyer, G.T. Economos, D.S. Edge, W.R. Ehrmantraut, N.E.S. Falk, L.H. Fenton, S.M. Fidler, A. Frank, A.A. Friedman, J.C. Gibbons, D.B. Goldberg, H.S. Goldstein, W.Y.K. Goo, D.H. Goodman, L.D. Green, P.A. Haber, J.T. Hagenbucher, F.K. Harris II, T.L. Hartman, W.H. Harvey, M.A. Herman, S.H. Houseman, D.H. Isaacson, M. Katikineni, H.I. Katzen, M.A. Kavalier, B. Kotelanski, I.P. Krefting, W. Kurstin, H.M. Lando, P.C. Latkin, S.D. Lerner, P.H. Levine, A. Lipson, J.P. Lucas, D.J. Lynn, D.C. Marcus, R.A. McConnaughy, B.A.M. Meyers, F. Meyers, G.H. Miller, V.T. Miller, J.C. Mulhauser, R.A. Nicklas, A.A. Nimetz, R.A. Noble, A.A. Oboler, G.M. Orr, R.J. Osheroff, B.H. Ostrow, S.W. Park, M.A. Parker, M.M. Phillips, P.W. Poth, A. Primack, D. Ramaswamy, J.N. Ramey, S.N. Richman, D.N. Robins, J.D. Robinson, N.B. Rohatgi, M.H. Rose, J. Rosenberg, R.R. Rothenberg, A. Rotsztain, N.H. Rubenstein, F.M. Ryan, T.L. Sacks, M. Schneider, R. Schoenfeld,

S.A. Schwartz, P.M. Selfon, J.C. Seymour, M.M. Shefferman, P.B. Sherer, B.E. Sherwin, M.A. Sislen, J.T. Solano, I. Spector, M. Stock, J.M. Taubin, P.A. Thomas, D.H. Waterman, J.H. Weiner, I. Weiszer, A.L.B. Williams, J.W. Winkler

Assistant Professorial Lecturers: M.M. Parker, J.H. Shelhamer

Instructors: W.H. Boom, E.G. Rodriguez

Clinical Instructors: L.A. Achankunju, E. Aleskow, H.J. Alpert, P. Basch, C.L. Bender, M.R. Capon, T.H. Clark, R.L. Ellis, N. Gonzalez, H. Gordon, S.L. Horwitz, J.P. Kalman, M R. Kendall, R. Kramer, A.S.T. Lai, S. Leibenhaut, I.V. Magal, N. Mendjuk, D.E. Millon, M. Nemati, H.A. Schumann, P.S. Spiegler, R.S. Waldman, M.T. Wallace, L.M. Weinberg

Special Lecturer: S. Katz

201 **Diagnostic Studies in Clinical Medicine** (1) Scott

Combination of didactic sessions concerning physiopathology and its correlation to laboratory studies, practical sessions, and case problems as they relate to the utilization of laboratory and other diagnostic procedures, with emphasis on decision making. Second-year students only.

250 **Introduction to Occupational and Environmental Medicine** (2) Chase

Health effects of various occupational and environmental hazards and pollutants discussed from several perspectives, including basic research, federal regulation, labor/management, and physician. Health effects of radiation, air and water pollution, toxic substances, and environmental extremes. Limited enrollment.

305 **Inpatient Clerkship** (10) Staff

Required for medical students. Comprehensive study of patients: history and physical examination; ward rounds, consultations, conferences, preceptorial teaching, seminars. V.A. and Univ. Hosps.; Wash. Hosp. Center. (8-week periods throughout academic year)

331 **Acting Internship in Medicine (Hematology–Oncology)** (arr.) LaRosa

Assignment to a ward team dealing exclusively with oncologic problems. Many patients will be on chemotherapy protocols, all will be seriously ill and in need of considerable special attention. Special conferences and regular house staff conferences. Students take night call with the ward team and are expected to function at the level of interns on the team. 4-week periods. Univ. Hosp.

332 **Acting Internship in Medicine** (5) LaRosa

Assignment to a ward team. Responsibility for completing initial patient evaluation and diagnostic and therapeutic plans, writing all medical orders (which must be countersigned by an M.D.), coordinating patient's care, writing progress notes, and dictating discharge summary. Night call with the ward; supervision by team resident. Chief resident meets weekly with acting interns to review cases.

333 **Acting Internship in Medicine** (5) Curtin

Under the supervision of the medical resident and attending physician, student works with a patient-care team on a medical ward, does initial evaluation, and presents patient's problem at attending rounds and appropriate teaching conferences. Subspecialty consultants review patient's problem with student. 4-week elective periods. Wash. Hosp. Center.

334 **Acting Internship in Medicine** (5) O'Connell

Assignment to a patient-care team under direct supervision of a University resident on general medical wards. Problem-Oriented Medical Record System used. Students complete initial patient evaluation data base; are responsible for clinical management during hospitalization; write all orders.

which must be reviewed and cosigned by the resident; and present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. 4-week elective periods. V.A. Hosp.

335 **Acting Internship in Medicine** (5) Wisneski
Academically oriented acting internship in a community hospital setting. Emphasis on basic clinical medicine. Responsibilities of intern. Holy Cross Hosp.

336 **Intensive Care Medicine** (5) Friedman
Student works on Intensive Care Unit with intern-like duties. 4-week elective periods. Wash. Hosp. Center.

338 **Occupational and Environmental Medicine** (arr.) Chase
Assignment to Washington Occupational Health Associates, where the effects of various occupational and environmental health hazards are addressed. Participation in clinical intervention, under physician's supervision. Emphasis on relationship of occupational and environmental medicine to practice of primary care. Travel opportunity to distant field sites is generally available.

348 **Infectious Disease** (5) Karney
Patients with a variety of infectious diseases are seen and evaluated in conjunction with an infectious disease Fellow and attending physician. Natl Naval Med. Ctr.

349 **Infectious Diseases** (5) Curtin and Levy
Clinical experience on infectious disease service. Daily work rounds, including lab, conferences, journal club. 4-week elective periods. Wash. Hosp. Center.

350 **Infectious Diseases** (arr.) Parker
Introduction to the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students assume primary responsibility for infectious disease consultations in conjunction with Fellows, residents, and full-time faculty members. Clinical application of laboratory techniques used in the diagnosis and treatment of patients with infectious disease problems. Emphasis on the usefulness of rapid diagnostic techniques and pharmacology of antimicrobics. Students participate fully in all section activities. 4-week elective periods. V.A. Hosp.

351 **Infectious Diseases** (arr.) Tuazon
Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical, and laboratory examination. Students learn to do quality infectious disease consultations and how to use antibiotics intelligently. Students electing periods longer than 4 weeks will assist with a research project on infectious drug abusers, staphylococcal bacteremia, and endocarditis and with *in vivo* and *in vitro* antibiotic synergy and white blood cell studies.

352 **Cardiology** (5) Hsu and Staff
Designed to provide experience in ambulatory and hospitalized patient care. ECGs, graphics, CCU, exercise lab; observation in cath. lab. 4-week elective periods.

354 **Preceptorship in Cardiology** (5) Ross
Placement with an affiliated Washington-area practicing cardiologist. Exposure to office and hospital cardiology and electrocardiography.

356 **Cardiovascular Diseases** (5) Haider, Meyer
Students participate in two clinical arenas: (1) nonemergent cardiac problems and (2) routine problems and their diagnostic evaluation. Rounds three times weekly, weekly teaching conferences with members of the Cardiology staff. Later assignment to a 12-bed critical-care unit that includes coronary patients and medical–surgical patients with intensive-care problems. Stu-

dent works with a senior resident and works up all patients admitted to this unit. Daily rounds with teaching physicians. Student assists in the care of critically ill patients and those with suspected myocardial infarction or cardiac arrhythmias. Exposure to invasive monitoring and therapeutic techniques.

358 **Cardiology—Washington Hospital Center** (5) Lindsay and Staff
Active participation in the clinical cardiology service of Washington Hospital Center. Bedside evaluation correlated with electrocardiography and other diagnostic studies, including stress testing, phonocardiography, echocardiography, cardiac catheterization, and nuclide angiography. 4-week elective periods.

359 **Coronary Care Unit—Washington Hospital Center** (5) Mendelson
Active participation in the care of patients on the Coronary Care Unit of Washington Hospital Center. Student works closely with house staff and attending staff. Emphasis on diagnosis and treatment of coronary disease, complications of infarction, diagnosis and treatment of arrhythmias, and selection of patients for surgical intervention. 4-week elective periods.

360 **Cardiology** (5) Fletcher*
Experience in clinical cardiovascular problems under supervision of cardiology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization explained and results in specific cases discussed. Electrocardiography covered as one of the tools used to approach the cardiovascular patient. Patient management is integral part of course. Teaching rounds and conferences. 4-week elective periods. V.A. Hosp.

361 **Cardiology—NIH** (arr.) Rosing
Broad exposure to all aspects of congenital and acquired cardiac disease. Participation in diagnostic and therapeutic work-up of patients and evaluation of acute and long-term effects of medical and surgical interventions.

363 **Cardiac and Medical Intensive Care—V.A. Hospital** (5) Saunders†
Participation in all aspects of coronary and medical intensive care: critical care diagnostic and therapeutic techniques (mechanical ventilation, right heart catheterization and central hemodynamic monitoring, temporary cardiac pacing, arrhythmia evaluation and management). Call every third night.

370 **Endocrinology** (arr.) El-Khodary
Assignment as an acting intern to work with a second- or third-year resident. Admit and work up patients. Consultations of the General Medical Service on patients with endocrine problems. Daily rounds and weekly teaching conference to discuss endocrine problems in depth. Opportunity to attend teaching duties at D.C. General Hospital. In-depth evaluation of patients with endocrine problems, emergency care of patients admitted to medical floors and Intensive Care Unit for serious life-threatening endocrine emergencies.

371 **Endocrinology** (5) Gaskin
Evaluation of patients referred to the endocrinology service, participation in planning diagnostic work-ups and therapy, and responsibility for case presentations and follow-up of those patients. Daily clinical rounds and weekly endocrine clinic and diabetic clinic. Weekly endocrine conference includes journal club once a month and pediatric endocrinology once a month. Rounds and conferences at the V.A. and G.W. Hospitals when

*Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.
†Dr. Saunders is Assistant Chief of Medicine for Intensive Care at the Veterans Administration Hospital.

possible. Daily review of assigned reading. 4-week elective periods. Wash. Hosp. Center.

372 **Endocrinology and Diabetes** (5) Ratner
Clinical experience in endocrinology and metabolism; emphasis on outpatient care of diabetes mellitus with longitudinal follow-up. Students examine patients and participate in the diagnosis and planning of therapy. Daily rounds, weekly diabetic pregnancy clinic, didactic lectures, and case discussions. Univ. Hosp.

373 **Endocrinology and Metabolism** (5) Becker
Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Daily clinical rounds; weekly endocrine clinic, diabetic clinic, and journal club, case discussions, didactic lectures. Twice-weekly endocrine reviews based on assigned reading. V.A. Hosp.

375 **Endocrinology Research** (arr.) Becker
Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic techniques, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor.

390–95 **Extramural Internal Medicine Elective** (arr.)
The department will permit students to spend elective periods at other institutions. Interested students should contact the department chairman.

402 **Research in Cancer Immunology** (10) Hollinshead
Laboratory experience with tests used to correlate hormonal and systemic immune reponses with the clinical course of the disease; use of affinity chromatography, isotachophoresis, T-cell TAA-directed rosette tests, and other new procedures for study of monospecific or monoclonal antibodies, immune complexes, and tumor-associated antigens.

403 **Oncology** (arr.) Cohen
Participation in clinical management of patients with carcinoma on the oncology ward. Methods of clinical research are stressed. V.A. Hosp.

404 **Medical Oncology** (arr.) Young
Current methods of evaluation and treatment of lymphomas, Hodgkin's disease, testicular tumors, ovarian, breast, and other malignancies, including a view of the broad spectrum of these diseases. Participation in patient care and review of clinical trials. Procedures such as bone marrows, liver biopsies, and other staging techniques. National Cancer Inst.

405 **Introduction to Medical Oncology** (5) Priebat
New patient consultations, ward rounds, and clinic on patients with both hematologic malignancies and solid tumors. Daily discussions on selected topics in medical oncology. Interdisciplinary conference with V.A. Hosp. also included. Wash. Hosp. Center.

412 **Gastroenterology** (arr.) Danish
Work in a suburban office devoted to private practice of internal medicine with emphasis on gastroenterology. Office practice, hospital rounds, evaluation of problems, discussion with attending physicians and patients in terms of diagnosis and management, observation of and assistance in specialized GI procedures, and practical aspects of office management.

413 **Gastroenterology/Hepatology** (5) Zimmerman
Intensive clinical experience with patients who have digestive diseases of the gastrointestinal tract, liver, and pancreas. Patient consultations, teaching rounds, seminars. Joint conferences with surgery, pathology, and radiology emphasize multidisciplinary approach to digestive diseases. 4-week elective periods. Univ. Clinic.

414 **Gastroenterology/Hepatology—Nutrition** (arr.) Seeff
Students work closely with Fellows in the gastroenterology hepatology section, seeing patients on consultations and being involved in the initial evaluation, patient investigation, and follow-up. Close supervision is afforded by both the senior Fellows and senior staff. Direct or indirect participation in all specialized procedures involving various biopsy techniques and endoscopies. Teaching rounds, conferences, and seminars. V.A. Hosp.

415 **Gastroenterology** (arr.) Gold
Course includes direct patient contact on a consultative basis and participation in all section activities, including reviews of gastrointestinal pathology and radiology for individual patients and all procedures, particularly endoscopic. The student will be expected to develop a fundamental core knowledge of basic gastroenterology and to participate in a journal activity and may be called on to participate in a case presentation at monthly joint GI Grand Round sessions. Wash. Hosp. Center.

416 **Gastroenterology—D.C. General Hospital** (arr.) Rudzki
Participation in the daily activities: ward rounds with Fellows and attending physicians, endoscopic procedures (performed twice a week), journal club, GI medical–surgical conference, teaching conferences, and weekly clinic session. Direct responsibility for a number of consultations under the supervision of the GI Fellows.

417 **Gastroenterology** (arr.) Peura
Participation in daily inpatient and outpatient activities of the service. Walter Reed Hosp.

418 **Gastroenterology** (arr.) Benjamin
Participation in daily inpatient and outpatient activities of the service. Bethesda Naval Hosp.

419 **Gastroenterology** (arr.) Gibbons
Responsibility for the care of patients admitted with GI problems and consultations on patients on other services. Daily rounds and a weekly teaching conference. Maximal exposure to endoscopic procedures, including esophagogastroduodenoscopy, colonoscopy and polypectomy, laparoscopy, liver biopsies, and esophageal dilatation. Involvement with all patients in the Intensive Care Unit with acute gastroenterology problems. Providence Hosp.

423 **Gastroenterology** (5) Trujillo, O'Kieffe
Introduction to clinical problems in diagnosis and treatment of gastroenterology in both office and hospital practice. Peritoneoscopy, endoscopy, and biopsies. 4-week elective periods. Univ. Hosp.

430 **Hematology** (arr.) Schechter* and Staff
Participation in the evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, hematology clinic, and journal club. V.A. Hosp.

431 **Hematology and Oncology** (arr.) Lessin and Staff
Immersion in the process of diagnosis and therapy of hematologic and oncologic disorders, including inpatient and outpatient consultations, daily care, and follow-up of clinical hematologic and oncologic problems. Emphasis on blood and marrow morphology, tumor pathobiology, modern hematologic/oncologic diagnostic procedures, and treatment of blood diseases and cancer.

433 **Hematology** (5) Rheingold
Participation in diagnosis and treatment of patients with hematologic disorders. Experience in interpretation of peripheral smears and bone marrow slides. Primarily office practice setting with prn rounds on hospital cases.

*Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

434 **Hematology/Oncology** (arr.) — Yoo
Assignment with senior resident seeing all patients with hematologic and tumor problems for whom consultation is requested. Interpretation of blood smears and blood coagulation studies. Assistance in performance and interpretation of bone marrow examinations. Providence Hosp.

436 **Hematology Research** (10 or 15) — Schechter* and Staff
Research interests of the staff include lymphocyte tumor biology and platelet production and hemostasis. Facilities available to do *in vitro* culture of human peripheral blood, bone marrow, and tumors; radioisotopic studies; and electron microscopy. V.A. Hosp.

440 **Pulmonary Medicine** (arr.) — Spagnolo
Participation in the diagnosis and therapy of patients with pulmonary disease; introduction to the management of patients with acute respiratory failure. Daily ward rounds, chest roentgenology review sessions, participation in journal club and physiology conference. Emphasis is placed on acquainting the student with modern pulmonary diagnostic procedures and current literature. V.A. Hosp.

441 **Pulmonary Disease** (arr.) — Weiss
Responsibility for the care of patients admitted with pulmonary problems as well as performing consultations on patients on other services. Daily rounds and a weekly teaching conference. Weekly pulmonary physiology conference in which arterial blood gases, pulmonary function testing, and principles of respiratory care are discussed in depth. Consultation services and daily care of a small number on inpatients. Exposure to such procedures as pleural biopsy, thoracentesis, lung needle biopsies, and arterial puncture. Involvement on a consulting basis with all patients in the Intensive Care Unit with acute respiratory problems. Providence Hosp.

442 **Pulmonary Diseases** (5) — Friedman, Robinson
Interpretation of pulmonary function studies; daily teaching rounds and supervised consultation on patients with various pulmonary and infectious diseases. Participation in pulmonary clinic, techniques and principles of respiratory therapy. Principles of and experience with respiratory failure and respiratory intensive care. Wash. Hosp. Center.

447 **Pulmonary Medicine** (5) — Delaney, Spagnolo
Participation in the diagnosis and therapy of patients with pulmonary disorders. Ward rounds, chest roentgenology sessions, and participation in journal club. Emphasis on acquainting the student with modern diagnostic procedures related to patients with pulmonary diseases and current literature. 4-week elective periods. Univ. Hosp.

451 **Arthritis and Rheumatic Diseases** (5) — Jacobs
Participation in the evaluation and treatment of patients with rheumatic diseases, including inpatient and outpatient consultations, daily care and follow-up, and clinical conferences. Regular discussions of selected topics in rheumatology, emphasizing differential diagnosis, pathophysiology, and therapeutic modalities. 4-week elective periods.

452 **Rheumatology** (5) — Nachel
Active participation in the work-up and management of inpatients and clinic patients with rheumatic diseases. History, physical examination, differential diagnosis, immunological mechanism, x-ray reading, and use of laboratory tests will be stressed. 4-week elective periods. V.A. Hosp.

453 **Introduction to Arthritis** (5) — Barth
Work-up, rounds, clinic, and consultations on patients with arthritis and rheumatic diseases. Daily discussions on selected topics in rheumatology, including clinical immunology, major disease categories (SLE, RA, gout,

*Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

etc.), differential diagnosis, drug therapy, serological reactions, X-ray changes. 4-week elective periods. Wash. Hosp. Center.

454 **Rheumatology and Orthopaedics (Pediatric)** (arr.) White
Students participate in the evaluation, treatment, and follow-up of children with rheumatic and orthopaedic problems. Responsibilities in outpatient and inpatient services; can elect to participate in operations. Regular discussions of selected topics in rheumatology and orthopaedics; participation in clinical conferences, including physical medicine and radiology.

455 **Rehabilitation Medicine** (arr.) Chiu
Management of patients on the rehabilitation inpatient service under supervision. Initial medical and neurological work-up, setting of goals, and participation in team conferences. Outpatient work will include the use of electromyography and the neuromuscular examination as diagnostic tools and management of common musculoskeletal conditions. Rounds and teaching activities. 4-week elective periods.

460 **Renal and Electrolyte Disorders** (arr.) Pierce
Participation in consultations, rounds, and outpatient clinic on patients with renal and electrolyte abnormalities, follow-up of patients. Examination of the urinary sediment, peritoneum, and hemodialysis. Conferences, reading assignments, ward rounds, participation in journal club. 4-week elective periods. Wash. Hosp. Center.

461 **Renal Disease** (5) Thompson
Participation in clinical and laboratory procedures used in the study of renal disease. Ward rounds, consultations, conferences, seminars. 4-week elective periods. Univ. Hosp.

463 **Application of Tissue Immunology** (5)
Evaluation of the effects of plasmapheresis on immunologically mediated disease, technique of plasmapheresis and patient assessment during treatment, laboratory immunological assessment, including measurement of autoantibodies and immune complexes, correlation of immunological markers with the course of the disease. 4-week elective periods. Univ. Hosp.

465 **Renal Diseases and Fluid and Electrolyte Problems** (5) Jacobson
Participation in office and hospital consultations; care of patients with renal diseases and fluid electrolyte problems. Familiarization with a variety of renal problems, work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature. 4-week elective periods.

469 **Renal Disease** (arr.) Shalhoub*
Broad exposure to and active participation in all clinical activities of the renal section, including consultations, hemodialysis, outpatient clinic, rounds, conferences, and journal club meetings. 4-week elective periods. Time period must first be cleared through instructor's office. V.A. Hosp.

471 **Allergy Clinic** (arr.) Summers
Lectures, conferences, and attendance at the allergy clinic, where both adult and child patients are seen. Detailed history taking, physical examination, and skin-testing techniques. Discussion of each case with an allergist to develop a complete management program. Emphasis on clinical aspects of immunology. 4-week elective periods. Walter Reed Hosp.

472 **Private Office Practice of Allergy** (3) Barr
Combined elective with allergy clinic at Univ. Hosp. and Children's Hosp. 2-week elective periods.

492 **Emergency Medicine** (arr.) Goodson
Assignment as an acting physician (resident) in the emergency room.

*Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.

Emergent and nonemergent ambulatory problems. Providing primary care under the direction of full-time physicians and medical and surgical residents. Patients are seen with medical, surgical, pediatric, psychiatric, trauma, and ob gyn problems. Emergency therapy will be instituted prior to admission or prior to discharge. Providence Hosp.

494 **Clinical Cancer Epidemiology** (arr.) Levine
Through the clinical epidemiology branch of NIH, students can choose to participate in research and consultation in the clinical etiology of cancer, seeing patients with peculiarities in the occurrence of cancer that raise the possibility of detecting clues to the etiology of tumors, the application of computer technology to epidemiologic studies; or registry of rare tumors (investigating etiology of rare disorders, e.g., the American Burkitt Lymphoma Registry). Members of this branch participate in the genetics clinic, and opportunities for clinical contact while pursuing a research experience and learning basic epidemiologic approaches are possible. Useful for students considering preventive medicine/epidemiology/public health as a career. N.I.H.

495 **Oncology Review** (arr.) Hollinshead
Each student is assigned a carefully selected reading list on one form of cancer. Fundamentals, basic research, and latest clinical approaches are discussed in detail. Each student writes and illustrates a review of his or her subject. Interested students are encouraged to undertake individual research projects the following summer.

501 **Immunopathogenesis of Human Disease** (3) Ferrell
Two-week course, coordinated by the Division of Rheumatology, to review recent advances in immunobiology and correlate this information with clinical manifestations and immunopathogenesis of selected human diseases. Lectures, group discussions based on relevant clinical problems, required reading, and independent library research. Students are required to prepare a paper based on independent study and to present the findings at a seminar during the second week of the course. Offered only if a minimum of seven students register.

502 **Issues in Clinical Nutrition** (3) Spiegel
Intensive two-week analysis and evaluation of recent scientific data in the area of human nutrition. Topics include megavitamins, trace elements, food additives, fiber content, lipids, proteins, immunological responses, and nutrition as they influence health and disease. Faculty from the Departments of Biochemistry and Medicine participate in the course. Daily didactic sessions; three seminars per week for discussion and analysis of assigned reading. Each student studies one specific area of interest and presents a written analysis of the scientific data. Students interested in weight management and preventative health problems may also elect limited participation in clinical department activities in these areas.

503 **Clinical Physiology of Acid–Base and Electrolyte Disorders** (3) Spiegel
In-depth review of renal physiology as it relates to clinical medicine. Emphasis on water and electrolyte regulation as well as acid–base and electrolyte disorders. Daily didactic sessions; three seminars with problem-solving cases per week; homework exercises and assigned reading. Each student prepares an in-depth written report on a clinical entity directly related to a selected fluid and electrolyte disorder, to be presented in the seminar.

Microbiology

Chairman: L.F. Affronti

Professors: L.F. Affronti, K.-Y. Huang, R. Hugh, P.D. Kind, C.V. Reich *(Research)*, M. Reich
Associate Professors: J.W. Albright *(Research)*, J.H. Grossman III, G.V. Stokes
Adjunct Associate Professor: J.D. MacLowry
Associate Professorial Lecturer: R. De Giovanni-Donnelly
Assistant Professors: B.T. Backus *(Research)*, J.T. Kvach *(Research)*, G.E. Wagner
Adjunct Assistant Professors: J.A. Bradlaw, V.M. Turner

128 **Microbiology for New Health Practitioners** (2) — Staff
Lecture course for students in Allied Health program. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

129 **Immunology: Introduction to Immunologic Fundamentals** (3) — Affronti, Silver
Lecture course for medical technology class; open to others. Fundamental immunologic concepts. Serologic and immunologic procedures as applied to clinical and research situations. Prerequisites: an introductory microbiology course and chemistry (inorganic and organic), or permission of instructor. (Spring)

201 **Medical Microbiology** (8) — Staff
Required for medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, and immunological concepts that relate to the health and disease of humans—cultural studies, methods of diagnosis, theories. Laboratory fee for nonmedical students, $20. (Spring)

211 **Microbiology** (4) — Staff
For graduate students. Bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22 or other biochemistry course and permission of instructor. Laboratory fee, $20. (Fall)

212 **Pathogenic Bacteriology** (3) — Hugh
For graduate students. Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial disease of man. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 **Tissue Cell Culture** (3) — Staff
For graduate students. Fundamental aspects of tissue culture with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures with emphasis on quality control practices. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Parasitology** (2) — Turner
For graduate students; open to medical students. Study of host–parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 **Scientific Writing** (1) — Wagner
For graduate students. Provides basis for preparing theses, dissertations, and publications. (Fall)

223 **Antimicrobial Chemotherapy** (1) Reich, Affronti
For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Members of the clinical faculty discuss relevant aspects of clinical chemotherapy. Prerequisite: Micr 201. (Fall)

225 **Microbial Physiology I** (3) Reich
Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221-22, Micr 211, or equivalent. (Fall)

226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly
Actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular levels. Prerequisite: Micr 225 or permission of instructor. (Spring)

227 **Microbial Physiology Laboratory** (2) Reich
Application of laboratory techniques and instrumentation to topics covered in Micr 225-26. Prerequisite Micr 226. Laboratory fee, $20. (Fall)

229 **Immunology** (3) Kind, Affronti
For graduate students. Lecture course. Fundamental immunologic concepts. Lectures cover antigens, antibodies, antigen–antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor.

230 **Immunology Laboratory** (2) Kind, Affronti
Methods in serology, immunochemistry, and cellular immunology that are used in research laboratories are emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in a degree program. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind
Lecture course. Study of immunological functions of reticuloendothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, and delayed hypersensitivities. For medical students; open to graduate students with permission of instructor. (Fall)

233 **Virology** (3) Stokes
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Stokes
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
History of bacterial classification, international rules of nomenclature as applied to bacteria, development of bacterial classification based on relationships, and survey of characteristics of bacterial groups. Prerequisite: Micr 201 or 212 or equivalent. (Fall, odd years)

250 **Pathogenesis of Microbial Infections** (1) Hugh
Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections in humans. Host and agent factors that specifically influence resistance to infection.

251 **Clinical Laboratory Bacteriology** (3) Hugh
For graduate students; open to medical students. Detection and identification of bacterial agents that cause diseases in humans. Comparative isolation and identification methods, emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 201 or equivalent. (Fall, even years)

252 **Medical Parasitology** (1) Turner
For medical students; open to graduate students. Lecture and laboratory

course. Life cycles, epidemiology, clinical manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections are presented. In the laboratory, the recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens are emphasized. (Fall)

255 **Clinical Virology** (1) Huang
Primarily elective course for medical students; open to graduate students. General principles of virology; emphasis on clinical situations. Prerequisite: Micr 201 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti
Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221-22 or equivalent, Micr 229. Laboratory fee for nonmedical students, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind
Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff
Required of graduate students. (Academic year)

280 **Virology** (arr.) Huang
Selected problems, library assignments, laboratory studies.

281 **Biological Basis of Infections** (arr.) Affronti, Wagner
Selected problems, library assignments, laboratory studies, term paper.

282 **Immunology** (arr.) Affronti, Kind
Selected problems, library assignments, laboratory studies, term paper.

283 **Bacteriology** (10) Hugh
Selected problems, library assignments, laboratory studies, term paper. 8-week elective periods.

289 **Inflammation, Immunity, and Hypersensitivity** (5) Affronti, Kind
4-week elective periods.

290–91 **Extramural Microbiology Elective** (arr.)
The department arranges for medical students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
By special arrangement with individual staff members, a limited number of students with previous background in research may register for 2 to 4 semester hours of credit. Four clock hours will be spent in laboratory work for each semester hour of credit. Research report required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Neurological Surgery

Chairman: H.V. Rizzoli

Professors: J.J. Bernstein *(Research)*, A.I. Kobrine, G.A. Morales, H.V. Rizzoli
Clinical Professors: M.G. Alper, H.H. Ammerman, F.D. Cooney, G. Dichiro, G.J. Hayes, N.J. Horwitz, A.P. Hustead, C.L. Li, A.K. Ommaya, D.A. Ruge
Professorial Lecturers: V.W. Armbrustmacher, P.L. Kornblith
Associate Professors: C.B. Early, D.E. Evans, S. Koulouris
Associate Clinical Professors: W.E. Lawrinson, E.U. Mannarino, J.P. Murphy
Assistant Professors: I.S. Baron-Starke, M.K. Hammock
Assistant Clinical Professors: B.J. Ammerman, J.W. Barrett, E.B. Byrd, C.P.H. Carroll, M.W. Dennis, J.R. Howe, J. Kushner, F.T. Schwartz, B.H. Smith, B. Stopak
Clinical Instructor: K. Ghaemi

302 **Clinical Clerkship in Neurosurgery** (3) — Staff
2-week elective periods. Univ. Hosp.

380 **Clinical Neurosurgery** (5) — Staff
Clinical clerkship in neurosurgical service. Emphasis on neurologic examination; indications for special neurologic and operative procedures. 4-week elective periods. Med. Fac. Assoc.

382 **Clinical Neurosurgery** (5) — Early
Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Nat'l. Naval Med. Center

383 **Pediatric Neurosurgery** (arr.) — McCullough
Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Children's Hosp.

387 **Clinical Neurosurgery** (arr.) — Cooney
Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Wash. Hosp. Center.

390–92 **Extramural Neurosurgery Elective** (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

501 **Contemporary Problem Solving in Neurological Surgery: Historical Perspectives** (3) — Horwitz
Analysis of major areas of concern to the neurosurgeon, using hospital case studies. Emphasis on integration of relevant history, neurological findings, diagnostic procedures, and surgical alternatives. Exploration of dynamics of underlying pathophysiology and discussion of landmarks in literature. Importance of working knowledge of neuroanatomy and neurophysiology is stressed.

Neurology

Chairman: G.F. Molinari
Director of Encephalographic Laboratory: A. Racy

Professors: C.K. Conners, D.O. Davis, G.F. Molinari, S.A. Shelburne, Jr.
Adjunct Professors: C.H. Gunderson, D.E. McFarlin
Professorial Lecturer: N.P. Goldstein
Associate Professors: A.B. Barnet, R.A. Lavine
Associate Clinical Professors: K. Abraham, R.N. Edelson, D.J. Fishman, A.J. Levens, N.C. Myrianthopoulos, K.B. Nelson
Assistant Professor: H.A. Emsellem
Adjunct Assistant Professors: M.E. Archutowska-Kempka, J. Liberman, J.H. Lossing
Assistant Clinical Professors: F.H. Anderson, V.J. Blazina, M.M. Davis, V.A. Duggins, A.J. Friedman, G.P. Gabe, A.P. Galdi, J.F. Grim, J.E. Hogg, M.C. Korengold, R. Kratz, R. Laureno, W.E. Lightfoote II, N.A. Luban, W.E. Lux, Jr., J.F. Morales, L.K. Ng, M.A. Osborn, K.C. Rickler, D. Satinsky, H.M. Silby, E.C. Wilner, J.R. Wittenborn
Instructor: A.M. Smith

380 **Clinical Neurology** (arr.) — Molinari and Staff
Emphasis on neurologic examination; indications for special neurologic tests, e.g., arteriograms, pneumoencephalograms. 4-week elective periods. Univ. Hosp.

383 **Clinical Neurology** (5) — Gunderson
Emphasis on neurological examination and basic sciences, including neuroanatomy, as applied to clinical material. 4-week elective periods. Walter Reed Gen. Hosp.

384 **Clinical Neurology** (arr.) — Laureno
Clerkship in neurology. Participation in neurology consultation service, clinic, and seminars. In-depth research for formal seminar presentation. 4-week elective periods. Wash. Hosp. Center

385 **Office Practice of Neurology** (5) — Edelson
Participation in a busy ambulatory neurology practice, using on-site diagnostic technology. Opportunity to visit three practice sites, gaining exposure to neurologic diagnosis. Opportunity to spend unlimited time in EMG-EEG, evoked response labs, and neuroradiology.

390–94 **Extramural Neurology Elective** (arr.)
Students electing clerkships at the University Hospital can spend another elective period in another institution. They should arrange the elective with the other institution and bring a letter of acceptance to the chairman of the department of neurology for approval. The student is responsible for reporting the grade received to the department of neurology, which in turn will submit it to the Associate Dean for Student Affairs and Admissions.

395 **Neurology Research** (arr.) — Laureno
Participation in ongoing research in fluid electrolyte derangements and their effects on brain and muscle. Interested students should contact Dr. Laureno before registering for this elective. Wash. Hosp. Center.

Obstetrics and Gynecology

Chairman: A.B. Weingold

Professors: R.H. Barter, J.B. Craft, Jr., N. Filipescu, L. McGowan, C.C. Rogers, J.D. Schulman, J.G. Sites, B. Waxman, A.B. Weingold

Clinical Professors: S.M. Belinsky, W.H. Cooper, O.I. Dodek, Jr., M.P. Footer, J.M. Friedman, J.M. Grodin, H.L. Kotz, W.P. McKelway, J.W. Pearson, Jr., N.J. Price, N.M. Tart, E.W. Titus, Jr., J.C. Walsh, Jr.

Professorial Lecturers: L.M. Hellman, D.H. Kushner, J.L. Sever, J.B. Sheffery

Associate Professors: M.C. Edwards, M.A. Fletcher, J.H. Grossman III, J.W. Larsen, Jr., R.J. Stillman

Associate Clinical Professors: A.A. Becker, J.M. Close, W.F. Colliton, S.D. Cooley, A.A. Freier, E.E. Gahres, C.R.A. Gilbert, E.K. Herz, H. Klaus, W.T. Lady, S.H. Lipsius, L.M. Liverett, S.C. Marinoff, D.H. Martin, L.Q. Pugsley, A.I. Robins, M. Rosenbaum, I.W. Rovner, J. Sacks, P. Soyster, S.F. Stewart, Jr., H.P. Treichler

Assistant Professors: A.J. Friedman, J.L. Marlow

Assistant Clinical Professors: J.E. Anderson, M.F. Anderson, E. Atiemo, R.E. Badwey, B.A. Band, H.C. Beaver, J.D. Berryman, D.R. Carlson, D.C. Cinnamon, W.D. Cooper, E.E. Cunningham, A.A. De Moya, S.J. Dispenza, Jr., B.G. Douglas, R.V. Erkenbeck, L.E. Fettig, J. Fogel, S.P. Gardner, R.J. Gillanders, C.S. Greenhouse, T.H. Gresinger, C.H. Heffron, Jr., A.J. Heintze, V.B. Hugh, M.A. Jerome, E.G. Koch, E.R. Kolvereid, M.K. Kowalski, A.I. Lao, A.M. Lazarus, S.T. Lee, L.S. Levine, R.H. Levitt, J.W. Lyles, R.S. Margolis, D.M. Margulies, L.A. Martel, E.S. Nawab, R.J. Orleans, J.C. Pan, J.D. Paulson, W.R. Perkins, L.C. Radice, P.K. Rattan, M.A. Ross, B.S. Rothman, J.E. SaFran, M.W. Sandmeyer, Jr., C.I. Schneiderman, T.W. Scott, S.H. Shea, J.C. Skilling, G. Speck, M.N. Steren, C.E. Townsend, C.L. Wagstaff, W.D. Wallace, Jr., A.W. Winshel

Instructors: M.M.R. Davis, S.W. Jaffe

Clinical Instructors: J.E. Alarcon, J.C. Bolan, J.E. Brody, P.A. Bryce, R.L. Castle, M.T. Cole, T.A. Cook, Jr., P.D. Cowell, R.J. Crane, M.W. Dukes, Jr., M.I. Evans, C.M. Ezekwueche, J.B. Greenberg, D.L. Hall, S.J. Horwitz, M.C. Jerome, C. Kim, B.A. Kleinman, S. Kovarick, J.H. Lane, K.H. Neblett, R.S. Newman, E.O. Obele, O.S. Oredein, R.J. Pierce, D.N. Powers, J.C. Rajagopal, H.R. Roberts, A.G. Robichaux III, L.A. Rosen, D.S. Saffan, S.A. Schlosser, M. Vatin

Special Lecturer: T.E. Schmitt

303 **Clinical Obstetrics and Gynecology** (10) — Staff

Required for medical students. Participation in all obstetrical and gynecological clinics, daily departmental conferences and ward rounds at University, Fairfax, and Holy Cross Hospitals. Mannequin demonstrations of mechanism of labor and various types of operative delivery. (8-week periods throughout academic year)

376 **Gynecologic Oncology** (5) — McGowan

Participation in clinical inpatient and office diagnosis and treatment of women with gynecologic cancer. 4-week elective periods. Med. Fac. Assoc.

377 **Cytogenetics and Prenatal Diagnosis of Birth Defects** (arr.) — Larsen

Study of cytogenetics and participation in genetic counseling, amniocentesis,

and laboratory evaluation of amniotic fluid. Students learn interpretation and preparation of chromosome karyotype.

378 **Reproductive Endocrinology** (5) Stillman
Participation in patient management of gynecologic endocrine and infertility problems, encompassing infertility work-up and operative diagnostic and therapeutic procedures. 4-week elective periods.

380 **Clinical Obstetrics and Gynecology** (arr.) Gahres, Radice, Rothman
Participation in patient care, clinics, surgery, and delivery. Alexandria Hosp.

381 **Perinatal Medicine** (arr.) Weingold, Bolan
Participation in high-risk obstetrics clinics and antepartum and intrapartum management of high-risk and normal obstetrical patients. Participation with the Fellow in maternal fetal medicine at the University Hospital and outlying hospitals.

383 **Clinical Gynecology** (arr.) Footer
Participation in office practice of gynecology.

390–95 **Extramural Obstetrics and Gynecology Elective** (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

501 **Didactic Reproductive Biology** (3) Jaffe
Interdisciplinary course. Lectures, labs, reading, and seminars reviewing basic anatomy, histology, embryology, and pathology of the female reproductive tract in the context of clinical obstetrics and gynecology.

Ophthalmology

Chairman: M.F. Armaly

Professors: M.F. Armaly, D.S. Friendly, D.E. Krueger *(Research)*
Clinical Professors: M.G. Alper, M.M. Parks, L.E. Zimmerman
Associate Professors: B.S. Fine *(Research)*, J.S. Zacharia
Associate Clinical Professors: W.S. Gilbert, L.M. King, Jr., F.G. La Piana
Assistant Professor: P.J. Riddle
Adjunct Assistant Professors: R.M. Chavis, D.F. Greer, K.H. Zaslow
Assistant Clinical Professors: D.G. Albert, D.K. Berler, H.N. Bernstein, D.T. Casey, W.P. Chalfant, Jr., R. Day, A.L. Fjordbotten, T. Frey, P.T. Gavaris, W.B. Glew, H.B. Gould, T.P. Keenan, M.D. Krinn, M.E. Lederman, J.H. Lodge, J.F. O'Neill, S.S. Pappas, D.E. Schwartz, K.A. Simon, J. Snyder, R.F. Stephens, S. Stoleru, R.N. Sunga, M.A. Von Fricken, D.M. Wanicur, P.V. Whitmore, H.S. Wicker, B.H. Zeavin, E.M. Zimmerman, M.H. Zimmerman
Clinical Instructors: B.S. Bruner, R.S. Deitch, P.A. Dorn, Jr., A.E. Eager, C. Edmonds, B. Ehrlich, L.M. Friedman, M.L. Gaspar, W.H. Hall, R. Huberman, W.S.N. Ibrahim, L.L. Kogan, D.L. Lanter, G. Liss, N.F. Martin, J.F. Nowell, L.E. Perraut, H.I. Rodman, N.J. Ronsheim, H.J. Starr, E.M. Titer

281 **Ophthalmic Pathology I** (1) L. Zimmerman
Basic science aspects of diseases of the eye. (Spring)

282 **Ophthalmic Pathology II** (3) L. Zimmerman
Diseases of the eye as revealed by gross and microscopic examination. Open to eight students. Armed Forces Inst. of Path. (Spring)

284 **Ophthalmic Pathology III** (5) — L. Zimmerman
Daily participation in service limited to pathology of the eye and its adnexa 4-week elective periods. Armed Forces Inst. of Path.

381 **Clinical Ophthalmology** (arr.) — Armaly and Staff
Observation and participation in examination, diagnosis, and management of wide variety of ocular conditions in ambulatory patients. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Med. Fac. Assoc.

382 **Clinical Ophthalmology** (arr.) — Cupples
Observation and participation in examination, diagnosis, and management of wide variety of ocular conditions. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Nat'l. Naval Med. Center.

383 **Clinical Ophthalmology** (3) — Ibrahim and Staff
Examination techniques, management decisions, follow-up, and outcome of clinical entities. Observation, demonstration, and discussion with the clinical faculty. G.H.A

390–92 **Extramural Ophthalmology Elective** (arr.)
Special elective program arranged for selected students at other institutions. Interested students should contact the chairman of the department

Orthopaedic Surgery

Chairman: J.P. Adams

Professors: J.P. Adams, H.L. Feffer, W.P. Fortune, F. Leonard *(Research)*, D.W. McKay, R.J. Neviaser, R.S. Snell
Adjunct Professor: P.I. Kenmore
Associate Professors: S.F. Gunther, S.S. Nason, D.B. Parsons *(Research)*, B.K. Slemmons, S.W. Wiesel
Adjunct Associate Professor: G.P. Bogumill
Associate Clinical Professors: D.M. Brody, R.L. Dow, U.M. Fortune, S.S Haas, R.J. Lewis, B.P. Vitek
Assistant Professors: H.O. Goller *(Research)*, M.M. Malawer, R.B. Reff
Adjunct Assistant Professor: H.S. Cattell
Assistant Clinical Professors: B.R. Ain, A.I. Dobranski, M.M. Gardner, J.H. Graeter, S.A. Lavine, C.C. MacCartee, Jr., C.W. McCutchen, P.A. Moskovitz, T.J. Neviaser, S.R. Rothschild, G.J. Schonholtz, M.A. Schultz, J.F Witte
Instructor: P.A. Labropoulos
Adjunct Instructors: W.J. Sadlack, J.R. Wells, Jr.
Clinical Instructors: J.A. Abend, R.L. Gaertner, J.W. Harvey, D.C. Johnson, R.G. Loeffler, H.N. Mininberg, R. Ottenberg

302 **Clinical Clerkship in Orthopaedic Surgery** (3) — Labropoulos and Staff
Required for medical students. Basic clinical rotation in orthopaedics for second- and third-year students and fourth-year students who have not had previous orthopaedic rotations. Inpatient, outpatient, and emergency clinical care, with ward and night call responsibilities. Physical diagnosis, X-ray interpretation, trauma, and reconstructive surgery. 2-week elective periods.

Univ., Children's, or V.A. Hosp. or Wash. Hosp. Center (predetermined by department).

351 **Trauma** (1) Adams, Haas, Snell
Relation of trauma to other disease entities and understanding of its effects on the musculoskeletal system. Description of pathophysiological changes on tissues locally and systemically and of psychological reactions that may accompany such changes. (Spring)

380 **Orthopaedic Surgery** (5) Wiesel
Students participate in care of orthopaedic inpatients and outpatients, daily rounds, and conferences under the direction of a faculty member at the University Hospital or one of the affiliated hospitals. Prerequisite: Orth 302. 4-week elective periods.

382 **Research in Orthopaedic Surgery** (arr.) Adams
Participation in orthopaedic research to be arranged with various faculty members. Prerequisite: Orth 302.

383 **Sports Medicine** (5) Haas
Introduction to athletic injuries, including prevention and management. Prerequisite: Orth 302.

390–93 **Extramural Orthopaedic Surgery** (arr.) Adams
The department arranges for students to spend elective periods in other institutions. Prerequisite: Orth 302. Interested students should contact the chairman of the department.

395 **Research in Orthopaedic Surgery** (arr.) Adams
Univ. Hosp.

Pathology

Chairman: H. Sidransky

Professors: S. Bloom, R.S. Chandra, W.L. Marsh, F.N. Miller, Jr., H. Sidransky, S.G. Silverberg, B.H. Smith, M.J. Valaske, M. Werner *(Laboratory Medicine)*

Clinical Professors: C.F. Bishop *(Radiation Therapy)*, C.B. Cook, L.G. Dickson, G.H. Guin, E.B. Helwig *(Dermatologic Pathology)*, N.S. Irey, F.B. Johnson, P.C. Legolvan, J.L. Luke *(Forensic Pathology)*, M.J. Matthews, R.S. Melville *(Laboratory Medicine)*, R.E. Palmer, S. Russi, D.L. Weiss, M.J. Williams, L.E. Zimmerman *(Ophthalmic Pathology)*

Professorial Lecturers: T.T. Antonovych, A.S. Rabson, W.C. Roberts *(Cardiology)*

Associate Professors: A.A. Abraham, Y. Al-Doory *(Laboratory Medicine)*, C.T. Garrett, J.H. Grossman III, J.G. Guccion, F.S. Jannotta, S.G. Kent, R.B. Lingeman, C.N. Murty *(Research)*, Y.C. Oertel, J.M. Orenstein, L.G. Ortega, N.K. Saini, B.C. Zook *(Comparative Pathology)*

Adjunct Associate Professors: J. Costa, S.R. Jones, R.J. Montali

Associate Clinical Professors: B.D. Blackbourne *(Forensic Pathology)*, G.G. Brennan, W.F. Enos, I.D. Godwin, D.R. Parkinson

Assistant Professors: H.P. Hawley, Jr., S.P. Kapur, C.M. Myrie, L.E. Nochomovitz, K. Patterson, R.H. Patterson, A.M. Schwartz, S. Silver, C.J. Zaloudek, J.A. Zeller *(Laboratory Medicine)*

Adjunct Assistant Professors: G.D. Imes, Jr., L.P. James, S. Kanhouwa, J.B. Moe, R. Singh, F.E. Taub, J.D. Toft II

Assistant Clinical Professors: G. Controni, F.W. Darr II, J.L. Hall, L.G.

Hefter, P. Lupovich, M.A. Nandedkar, P.C. Pieslor, M.K. Rifaat

Assistant Professorial Lecturers: R.E. Halbert II, M.T. Jessee, W.P. Monaghan, D.E. Uddin

Instructors: R.E. Dayhoff *(Research)*, G.J. O'Dowd, C.A. Smith

Lecturers: S.F. Boas, B.C. Cloherty, J.E. Forey, R.S. Horkman, J.W. Jones, R.J. Mohrbacher, W.A. Rey, C.J. Riendeau, D.G. Simons, R.J. Yankey

Special Lecturers: A.A. Cooper, W.C. Fox, S.G. Gerding, J.W. Guthrie, L.W. Ouderkirk, A.L. Richards, C.V. Tresnak, D.B. Waldron

Courses numbered 13–20 are limited to military personnel in the Medical Laboratory Technique Program.

13 **Hematology** (6) Staff
Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology

14 **Blood Banking** (6) Staff
Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.

15 **Clinical Laboratory Rotation** (14) Staff
Instructions in laboratory technique, stressing the application of theories and principles of clinical chemistry, clinical microbiology, hematology, and blood banking in the day-to-day operations of the modern clinical laboratory

16 **Clinical Chemistry** (5) Staff
Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons

17 **Urinalysis** (2) Staff
Principles and techniques of urine chemistry and microscopic analysis.

18 **Bacteriology** (6) Staff
Identification of pathogenic microorganisms by morphologic and cultural techniques.

19 **Parasitology** (4) Staff
Identification of human parasites and their life cycles, concentration methods, staining techniques, and media for culture.

20 **Serology** (2) Staff
Principles and techniques of antigen–antibody reaction and immunological responses.

Courses numbered 121–128 and 130–133 are open only to students enrolled in the Bachelor of Science degree program with a major in medical technology

121 **Introduction to Medical Technology** (4) Silver
Six-week orientation in laboratory medicine (Fall)

122 **Clinical Chemistry Lecture** (3) Staff
Lecture series on routine and special clinical chemistry techniques (Spring)

123 **Clinical Microbiology Lecture** (2) Silver
Lecture series on bacteriology, mycology, and virology (Fall)

124 **Blood Bank Lecture** (1) Marsh and Staff
Lecture series on immunohematology and transfusion service. (Spring)

125 **Clinical Hematology Lecture** (2) Smith
Lecture series on routine and special hematology and coagulation (Fall)

126 **Selected Topics in Laboratory Medicine** (2) Smith, Silver
Lecture and laboratory series on clinical parasitology. Miscellaneous topics in fluid analysis. (Spring)

127–28 **Pathology for New Health Practitioners I and II** (2–2) Staff
Lecture course with optional laboratory. Basic pathologic concepts and infectious diseases; language of pathology: fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathologic changes in the principal diseases of each organ system, presented in coordination with clinical lectures in Idis 301. (Academic year)

129 **Pathology for New Health Practitioners** (3) Staff
Lecture course with optional laboratory. Basic pathologic concepts and infectious diseases, language of pathology, fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathologic changes in the principal diseases of each organ system, presented in coordination with clinical lectures in Idis 301. (Fall and spring)

130 **Clinical Chemistry** (4) Silver
Rotation through the University Hospital clinical chemistry laboratory. (Fall and spring)

131 **Clinical Microbiology** (4) Silver
Rotation through the University Hospital clinical microbiology, mycology, and parasitology laboratories. (Fall and spring)

132 **Hematology/Coagulation** (4) Silver
Rotation through the University Hospital clinical hematology and coagulation laboratories. (Fall and spring)

133 **Blood Bank/Serology/Urinalysis** (4) Silver
Rotation through the University Hospital blood bank, serology, and urinalysis laboratories. (Fall and spring)

152 **Introduction to Basic Laboratory Medicine** (2) Smith
Theory, performance, and interpretation of some important routine clinical laboratory tests performed in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals, and laboratory. Prerequisite: Path 129. (Summer)

201 **Pathology** (8) Staff
A year course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies.

203–4 **Pathology** (4–4) Staff
For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 204: Path 203. (Academic year)

217 **Gross Autopsy Pathology** (1) Orenstein and Staff
Review of current necropsy cases with emphasis on the correlation of gross changes in the organs and the clinical history. Limited to second-year students. Univ. Hosp. (Spring)

220 **Medical Mycology** (2–4) Al-Doory
Lectures and laboratory to cover pathogenic fungi, mycotic diseases, and their clinical aspects. Laboratory fee, $20. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doory
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. Limited to second-year medical students. (Spring)

252 **Forensic Pathology** (1) Blackbourne
Medical examiner systems. Pathology of trauma, including automobile accidents, homicides, suicides, and other accidents. Narcotic deaths and the doctor as a witness in court. Second-year students only. (Spring)

253 **Medicine in Shakespeare** (1) Miller
Seminars with student and staff presentations covering the medically significant plays of William Shakespeare. Open to first- and second-year medical students. (Spring)

254 **Medicine in Literature** (1) Miller
Series of discussions with student and staff presentations covering novels, drama, nonfiction, and poetry of medical significance. Open to first- and second-year medical students. (Fall)

256 **Pathology of Infectious Diseases** (3) Abraham
Correlation of clinical, physiologic, immunologic, and pathologic mechanisms determining the course and morphological changes occurring in infections. Analysis of human case material and review of assigned selected readings. Prerequisites: Micr 211 and Path 203.

257 **Transmission Electron Microscopy in Pathologic Diagnosis** (3) Orenstein, Abraham
Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisites: Path 203–4, Anat 260 and 261.

258 **Organ System Pathology** (5) Bloom
Gross and microscopic study of human pathologic material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203–4. Permission of instructor required. (Fall and spring)

261 **Seminar in Experimental Pathology** (1) Sidransky
Current topics in research in experimental pathology. Limited to second-year medical students. (Spring)

266 **Comparative Pathology I** (1) Zook
Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to second-year medical students. Path. Lab., Nat'l. Zoological Park. (Spring)

270 **Medical Mycology** (1) Al-Doory
Review of major mycotic diseases with emphasis on opportunistic mycoses. Second-year students only.

280 **Surgical Pathology I** (2) Silverberg
Surgical pathology service at participating hospitals. Examining specimens from current surgical cases, correlating with clinical manifestations. Univ. Hosp. (Spring—3 hours per week)

284 **Ophthalmic Pathology** (arr.) Zimmerman and Staff
Daily participation in an active service limited to pathology of the eye and its adnexa. Inflammatory, degenerative, and neoplastic diseases are the major categories. Armed Forces Inst. of Path.

286 **Perinatal Pathology** (arr.) Kent
Focuses on important disorders that may beset the human fetus during the intrauterine period of gestation and the newborn infant during the early neonatal period. Emphasis on the role of placental abnormalities. Prerequisite: Path 203 or equivalent. (Spring)

289 **Clinical and Anatomical Pathology** (arr.) Cook
Designed to familiarize the student with the operation of a community

hospital Department of Pathology. Student may elect to spend essentially all of the time in some specialized area or may choose to study only anatomic pathology. If desired, a nuclear medicine elective can also be considered during this period. Fairfax Hosp.

290–92 **Extramural Pathology Elective** (arr.) Sidransky
The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Comparative Pathology II** (arr.) Zook, Montali, Jones
Participation in veterinary pathology service, including domestic, wild, and laboratory animals. Prerequisite: Path 201 or 203–4. Nat'l. Zoological Park Path. Lab. and Armed Forces Inst. of Path. (Fall or spring)

296 **Surgical Pathology II** (arr.) Silverberg and Staff
Evaluation of surgical specimens and correlation with clinical status of patient, description of gross and microscopic findings on assigned cases. Univ. Hosp.

297 **Dermal Pathology** (5) Hannagan
Microscopic conferences, review of current material, and study sets. 4-week elective periods. Prerequisite: prior arrangement with instructor. Armed Forces Inst. of Path.

298 **Necropsy Pathology** (arr.) Orenstein, Kent
Organ changes in disease, gross and microscopic correlation, preparation of protocols. Participation in autopsy pathology service. Univ. Hosp.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

301 **Clinical and Anatomical Pathology** (arr.) B. Smith and Staff
Opportunity to explore in depth a topic selected from the field of pathology; library study. V.A. Hosp.

302 **Forensic Pathology** (arr.) Luke and Staff
Participation in the activities of the office of the Chief Medical Examiner of the District of Columbia. Observation of death scene investigation techniques, medical–legal autopsies, and related toxicological laboratory analyses; attendance at court trials; and participation in the various scheduled conference activities of the agency.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Pharmacology

Chairman: H.G. Mandel

Professors: F.P. Abramson, V.H. Cohn, Jr., P. Klubes, H.G. Mandel, P. Mazel, J.A. Straw, J.R. Williams *(Research)*
Professorial Lecturers: J. Axelrod, E. Costa, C.-C. Lee, N.H. Neff
Associate Professor: R.J. Anderson
Assistant Professors: B.L. Bean, N.A. Brown *(Research)*, K.A. Kennedy

21–22 **Chemistry and Physics of Anesthesia** (3–3) Mazel and Staff
For students in nursing anesthesia. Fundamental concepts of physics, general chemistry, organic chemistry, biochemistry, and their application to medicine and anesthesiology, including chemistry of respiration, acid–base balance, clinical biochemistry and enzymology, hormones, radioisotopes, electronics, physiochemical properties of anesthetic agents, and other related topics. (Academic year)

110–11 **Pharmacological Basis of Anesthesia** (4–4) Mazel and Staff
For students in nursing anesthesia. Fundamental principles of pharmacology; drugs affecting the autonomic nervous system, central nervous system, and cardiovascular system; fundamentals of inhalation anesthesia; auxiliary drugs used in anesthesiology; endocrines, cancer chemotherapy; other topics. (Academic year)

114 **Drugs and the Consumer** (3) Cohn and Staff
General concepts concerning drug action in the body. Mechanism of action of some specific prescription and nonprescription drugs, including contraceptives, tranquilizers and sleep-inducing drugs; hay fever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisite required. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn and Staff
Psychological and sociological bases of recreational and other nonmedical use of drugs; pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems; legal and societal implications of and reactions to the nonmedical use of drugs; and prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, and hallucinogenic and psychedelic drugs. (Spring)

120 **Readings in Pharmacology for Anesthesia** (arr.) Mazel and Staff
For students in nursing anesthesia. Assigned reading in anesthesia and related areas; preparation of reports. Content differs each time course is offered; may be repeated for credit.

130 **Seminar: Accessory Drugs in Anesthesia** (2) Mazel and Staff
For students in nursing anesthesia. Presentation of the pharmacology and pharmacodynamics of accessory anesthetic drugs; emphasis on those areas not covered in Phar 110–11.

158 **Pharmacology for New Health Practitioners** (2) Klubes and Staff
For students in allied health programs. Basic pharmacology course. Drug preparations, the basis of their therapeutic and toxic actions, and their fate in the body. Prerequisites: HCS 110, 112, Phyl 111.

191 **Respiratory Care** (3) Mazel and Staff
(Same as Anes 191)
For students in nursing anesthesia. Advanced techniques for care of patients requiring total respiratory support.

195 **Electronics for Medical Personnel** (2) Mazel and Staff
(Same as Anes 195)
For students in nursing anesthesia. Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Signal conditioning, processing and display techniques, special purpose instruments, safety hazards.

201–2 **Pharmacology** (6–2) Straw and Staff
Required for second-year medical students. Lectures, laboratory, and conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Prerequisites: Bioc 201, Phyl 201, 212.

203 **Fundamental Principles of Pharmacology and Toxicology** (3) Cohn and Staff
Basic principles of pharmacology, including drug–receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, and drug toxicity. Admission by permission of instructor. (Fall)

205–6 **Pharmacology** (6–2) Cohn and Staff
For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Pharmacodynamics, mechanisms of action, physiological disposition, toxicity, and relative evaluation of drugs. Prerequisites to Phar 205: Bioc 221–22, Phar 203, Phyl 201, 212, or approval of department. Prerequisite to Phar 206: Phar 205. (Fall)

207 **Cardiovascular Pharmacology** (2) Bean
Physiology and pharmacology of cardiovascular diseases, hypertension, heart failure, coronary artery disease, and arrhythmia. Mechanism of action of drugs used in the treatment of cardiovascular diseases. Prerequisites: Phys 201 and Phar 201, 203, or 205. (Spring)

215 **Adolescent Drug Abuse** (3) Cohn and Staff
Not open to medical students. Offered off campus primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, marijuana, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

220 **Molecular Events in Toxic Actions** (2) Brown and Staff
Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 **Genetic Toxicology** (2) Williams and Staff
Action of chemicals and radiations in the induction of DNA damage and repair *in vitro* and *in vivo* and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221-22. (Fall)

224 **Developmental Toxicology** (2) Brown
Effects of exogenous agents on the processes of reproduction and development and their mechanisms of action. Toxic effects on the gametes, embryo, fetus, and neonate. Prerequisites or concurrent registration: Phar 203, 205. (Fall)

226 **Neurotoxicology** (2) Anderson
Mechanisms by which chemicals produce toxic effects on nervous tissue at subcellular, systemic, and behavioral levels. Effects of chronic and acute exposure. Prerequisites or concurrent registration: Phar 203, 205. (Spring)

230 **Special Topics in Toxicology** (arr.) Staff
Selected aspects of toxicology. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mazel and Staff
For medical and graduate students. Recent advances and fields of research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
For medical and graduate students. Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

259 **Readings: Cancer Chemotherapy** (2) Klubes and Staff
For medical and graduate students. Selected readings and discussions of

recent advances in cancer chemotherapy research. Prerequisite: Phar 201–2 or 205. (Spring, odd years)

260 **Endocrine Pharmacology** (1) Hertz and Staff
For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (3) Staff
For graduate students. Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff
For graduate students. Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn
For graduate students. Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, and excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 201 or 205–6 or permission of instructor. (Spring, even years)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff
Compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I–II** (1–1) Anderson and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, and laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III-IV** (1–1) Anderson and Staff
Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) Staff
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Suria and Staff
Fundamental principles of neuropharmacology. Electrophysiological and biochemical techniques in studying neuropharmacology. Neurotransmitters and their pathways in central nervous system. Drug effects on various neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205–6 or equivalent. (Spring, odd years)

286 **Research in Pharmacology** (arr.) Staff
For medical students. Participation in experimental studies on pharmacology, particularly endocrinology, cancer chemotherapy, or drug metabolism. (Fall and spring)

287 **Readings in Drug Abuse Literature** (arr.) Cohn, Klubes
Both professional and nonprofessional literature in the general area of drug dependence. Informal monthly luncheon discussions or assigned reading and preparation of a report. (Spring)

290–91 **Extramural Clinical Pharmacology** (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department. (Academic year)

295 **Reading and Research** (arr.) Staff
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Readings in Pharmacology** (arr.) Mazel
For medical students. Assigned reading and preparation of report. (Fall and spring)

502 **Clinical Use of Drugs** (3) Mandel
Approximately 10 morning discussions with a member of the Pharmacology Department and appropriate clinical faculty, dealing with the rational use of drugs in the treatment of disease. Afternoons devoted to independent reading and study. Course will be given only if there are seven participants. (Spring)

Physiology

Chairman: R.A. Kenney

Professors: J.J. Bernstein *(Research)*, M.M. Cassidy, M.J. Jackson, R.A. Kenney, C.S. Tidball, M.E. Tidball
Professorial Lecturers: D.O. Carpenter, J.C. Gillin
Associate Professors: R.A. Lavine, D.W. Watkins
Associate Professorial Lecturers: M. Frank, K.R. Spring
Assistant Professors: J.K. Kelleher, L.Y. Korman, M.R. Wells *(Research)*
Assistant Professorial Lecturer: P.J. Gunter-Smith

Departmental Prerequisite: Phyl 201 or equivalent for all courses numbered above 201.

111 **Physiology for New Health Practitioners** (3) M.E. Tidball
For students in physician assistant, nurse practitioner, and nursing anesthesia programs. Lecture, film, and demonstration. Function and process of the human body, covering the major organ systems.

191 **Selected Topics in Human Structure and Function** (3) Kenney
Lecture (2 hours), laboratory (1 hour). Structural and functional basis of physiology. Undergraduate course, required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11-12 or equivalent and consent of instructor. Open to Columbian College students with approval of advisor. (Fall)

201 **Physiology** (8) Staff
Required for medical students, open to graduate students. Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied human physiology. Prerequisites for graduate students: Anat 201 or Phyl

191 or equivalent; Bioc 201 or 221–22 (Bioc 222 may be taken concurrently); or consent of chairman of department. Open to consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) Jackson
Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to students in Columbian College with approval of advisor. (Fall)

212 **Neurobiology** (3) Staff
Same as Anat 212 and Idis 212. Integrated survey of the structure and function of the human nervous system, lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) Cassidy
Staff and student presentations from literature. Present work discussed; experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

251 **History of Medicine** (1) M.E. Tidball
Survey of the great contributors to physiology and medicine in the context of the times in which they lived and worked. (Fall)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy
Discussion of principles of fluid and acid–base balance and the application of these principles to specific situations. (Fall)

254 **Overview of Medical Computing** (2) C. Tidball
Medical applications of computers. Practical experience at a minicomputer console to demonstrate computer principles.

261 **Gastrointestinal Physiology** (arr.) Jackson
Weekly seminar; role of basic sciences in gastroenterology; intra- and extramural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney
Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems. (Fall)

268 **Muscle Contraction: Physiological and Biochemical Aspects** (1) Frank
Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction.

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Admission by permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball
Lecture one hour per week, practical experience at student's convenience. Orientation to digital and analog minicomputers. Programming in several languages, experience with one or more computers. No previous computer experience necessary. (Fall)

271 **Computer Simulation of Physiological Processes** (3) C. Tidball
Programming of physiological simulation will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent, or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball
Readings and discussion on physiological simulations and their evaluation. Prerequisite: Phyl 271 or equivalent, or permission of instructor. May be repeated once for credit

282 **Experimental Physiology** (arr.) Jackson
Participation in an ongoing research program in the department. Programs are currently available in the areas of membrane physiology and intestinal transport.

284 **Advanced Physiology** (arr.) Kenney
Guided readings and study or laboratory experience, or both, at an advanced level in a subfield of physiology. Prior arrangements should be made with the individual faculty member

290–91 **Extramural Physiology Elective** (arr.)
The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Research** (arr.) Staff
By special arrangement with individual staff members. Approximately four hours in the laboratory for each semester hour of credit (Fall and spring)

298 **Comprehensive Physiology** (arr.) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. This course satisfies the requirements for the Master's Comprehensive Examination, the Field Examination for doctoral students minoring in physiology, and Part I of the Cumulative General Examination in physiology. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

396 **Advanced Reading and Research** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problem. This course satisfies the requirement for Part III of the Cumulative General Examination in physiology. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Physiology of Aging** (3) Kenney
Guided reading and discussion on the normal process of aging.

Psychiatry and Behavioral Sciences

Chairman: J.M. Wiener

Professors: C.K. Conners, J.H. Egan, R.B. Kurz, J.D. Noshpitz, S. Perlin, J.E. Rankin, D. Reiss, P.J. Steinglass, T.G. Webster, J.M. Wiener

Adjunct Professor: R.E. Strange

Clinical Professors: S. Berman, C.T. Bever, B.S. Brown, P. Chodoff, R.M. Coleman, L. Cytryn, K.R. Gaarder, R.D. Gillman, G. Gordon, W.L. Granatir, M.A. Gravitz, S.I. Greenspan, J.S. Kafka, M.M. Katz, L.J. King, E.I. Kushner, H.P. Laughlin, B.W. MacLennan, I.W. Marill, H.A. Meyersburg, I.D. Milowe, T.D. Noble, B. Olshaker, R. Peele, J.L. Rapoport, H.L.P. Resnik, R.E. Rieger, C.B. Robinowitz, L.D. Robinson, J.G. Rubin, P. Rubovits-Seitz, R.L. Shapiro, M.F. Shore, J. Spurlock, W. Stark, W.J. Stockton, G.R. Ticho, H. Weiner, S.J. Wolin, H.H. Work

Associate Professors: J.K. Barber, L.A.M. Bennett *(Research)*, C.B. Feinstein, B.L. Frankel, M. Hertzman, J.J. McMillan, M.E.P. Oliveri *(Research)*, L.I. Sank, W.H. Scott, S.M. Sotsky, K.C. Wells, J.H. Wise

Adjunct Associate Professors: A.T. Billett, F.K. Millican, R.W. Steyn

Associate Clinical Professors: M.T. Advani, L.W. Allen, E. Black, B.L. Burris, M.J. Chalick, D.C. Choate, J.A.F. Chused, L.R. Conte, R.M. Costell, E.W. Cotlove, D.I. Davis, B.B. Doyle, R.C. Eisner, J.B. Erdmann, J.A.H. Forgotson, C.H. Frank, J.A. Frank, Jr., M.L. Garrett, R.B. Gerber, M.S. Glatt, S.L. Goodman, S. Gordon, Jr., R.M. Greenberg, R.L. Gross, M.R. Haas, S.P. Hersh, E.K. Herz, J.H. Herzberg, F.G. Hilkert, H.A. Hoffman, J.A. Huntzinger, W.C. Johnson, D.I. Joseph, I.H. Kaiser, K.L. Kaplan, J.J. Katzow, K.A. Kessler, B.J. Landau, H.B. Lehrman, L.D. Levi, E.J. Lieberman, S.H. Lipsius, T.M. MacKenzie, J.R.S. Malkin, A.E. Marans, J.E. Meeks, J.H. Menetrez, S.R. Palombo, J.M. Post, J.T. Quattlebaum, R.A. Ratner, K. Ravenscroft, Jr., M.E. Robinson, R.A. Rogers, S. Rosenblum, S.A. Savitz, G. Scarcella, N.A. Schweig, S.S. Sharfstein, J.L. Sheridan, M.R. Skolnick, J.H. Smith, M.J. Stern, B.C. Straight, E.S. Taylor, W.F. Thompson, D.L. Tippett, G.A. Tripp, H.J. Wain, J.P. Waletzky, A.F. Ward, Jr., D.R. Weinberger, P.S. Weisberg, S.M. Weissman, R.E. Wittenberg, P.G. Yessler, I.M. Zimmerman, J. Zinner

Associate Professorial Lecturer: M. Engel

Assistant Professors: M.A. Borengasser, B.A. Copeland, J.L. Gaiter, D.R. Glass, Jr. *(Research)*, R.L. Hendren, N.M. Horstmann, R.L. Jenkins, D.J. O'Donnell, E.M. Plionis *(Research)*, T.M. Richards *(Research)*, C.M. Rogers

Adjunct Assistant Professors: L.H. Haller, J.A. Jay, R.S. Richmond, S.E. Samenow, A.H. Taub

Assistant Clinical Professors: N. Alcasabas-Yadao, S.L. Aledort, R.G. Ammerman, B.S. Arons, W.E. Barquist, E.C. Bergman, M.C. Bhatia, S.L. Billett, J.H. Bouma, M. Boverman, C.V.A. Cabrera, D.L. Charney, C.T. Chastek, J.C. Chatel, I.M. Chatoor-Koch, J.M. Chertoff, W.F. Conger, L.A. Cove, N.R. Cutler, G.P. Davis, I. Dosovitz, L.S. Dworsky, R.C. Eisner, J.L. Evans, N.S. Ferebee, D.H. Fram, R.A. Frank, G.P. Gabe, D.J. Gardner, M.R. Goldberger, K.P. Gorelick, B.C. Gorman, R.A. Greenberg, H.R. Hagenau, C.D. Hanson, S.A. Hassan, A.L. Heine, N.B. Heller, S.G. Hershberg, J.H. Hochheiser, K.H. Huang, B.P. Jones, J.A. Jurand, R. Kayton, R.W. Keisling, R.A. King, J.E. Kleinman, W.M. Kokott, G.F. Kolodner, B.L. Kraff, L.E. Kreuz, P.A. Lange, D.A. Lanham, P.D. Leber, G.D. Legler, R.T. Lewit, D.G. Lipman, A.B. Livingood, T.J. Lustberg, J.R. Maloney, P. Mardelli, C.I. Margolis, B.P. McKaig, D.H. McKnew, Jr., H.M. Meagher, E.S. Meid, W.B. Mendelson, G.H. Miller, A.B. Molchon, D.T. Mosher, R.A. Nover, J.A. Nowak, A. Olaciregui, R.R. Palmer, J.J. Palombi, G.K. Palys, H.A. Pincus, D. Pope, V.E.L. Powell, V.E. Powell, J.W. R-Love, J. Raher, J.L. Read, H.W. Rice, K.C. Rickler, R. Rubovits-

Seitz, R.R. Ruttenberg, A.R. Sager, A.J. Salerian, A.H. Sandler, P.J. Santora, G. Schaeffer, J.A. Schoettler, G.W. Schwarcz, J.R. Sealy, C.S. Shaffer, F. Smithline, B.M. Smoller, E. Sorel, E.A. Sorrentino, G.J. Soverow, J.L. Speller, A.H. Stein, H. Steinberg, P.J. Steinberg, F. Strassburger, C.C. Titus, L. Turner, M.L. Usher, L.A. Vitulano, R.W. Wadeson, Jr., J.L. Wellhouse, R.B. Wertheim, D.C. Wilansky, N.L. Wilson, A.B. Zients, D.M. Zwerdling

Assistant Professorial Lecturer: A. Zappala

Adjunct Instructor: E.K. Wolf

Clinical Instructors: W.L. Anixter, J. Bloom-Feshbach, M.W. Gross, M.M. Herenda, R.B. Lott, K.L. Owens, G.P. Perman, S.E. Ridley, N. Sacirbey, T.A. Teplitz, X. Tonesk

Special Lecturers: J. Hoffman, R.L. Siegel

All clinical courses are five semester hours per four-week period.

250 **Individual Student Preceptorship** (1) Hendren and Staff
First- and second-year medical students can arrange individual preceptorships other than departmental electives listed below with the permission of the chairman of the department.

252 **Psychological and Social Factors of Medical Practice** (3) Barber and Staff
Required for medical students. Basic principles of the doctor–patient relationship. Analysis of psychological growth and development, family process, and the personality of the physician as they influence everyday medical practice.

301 **Psychopathology and Conceptual Models** (3) Wiener and Staff
Required for second-year medical students. Mental mechanisms, psychopathology, introduction to psychiatric syndromes, clinical interviewing, and behavioral sciences in clinical medicine. (Fall)

302 **Clinical Clerkship** (10) Webster and Staff
Required for medical students. Supervised examination, diagnosis, and outpatient and inpatient treatment at University, St. Elizabeths, Children's, and Washington V.A. Hospitals and Psychiatric Institute. Case conferences, seminars on psychiatric referral, "psychiatric" drugs, and community resources. Psychiatry in general practice stressed. (Fall and spring)

353 **Basic Psychoanalytic Concepts: Clinical Illustrations** (1) Wiener
Basic psychoanalytic concepts such as dreams, transference phenomena, and the various components of personality structure. Participation in discussions focusing on psychoanalytic issues and the relevance of such concepts to the practice of medicine in general. For first- or second-year medical students. (Eight two-hour sessions)

381 **Clinical Psychiatry** (arr.) Hertzman, Sotsky, Frankel, Hendren
Participation as acting intern in one or more of the psychiatry services of GWU Medical Center: inpatient and emergency (Hertzman), outpatient (Sotsky, Hendren), and consultation–liaison (Frankel). Assignments are based on student preference within limits of feasibility for the elective period involved. At least eight weeks preferable for supervised psychotherapy experience. Four-week elective emphasizes diagnostic assessment and brief-er treatment modalities.

383 **Psychological Aspects of Medical Illness and Care** (5) Frankel and Staff
Participation in an individualized program on the consultation–liaison service, with emphasis on psychosocial factors affecting the onset, manifestations, and treatment of medical illness; oncology; death and dying. Involve-

ment in consultation process, conferences, liaison meetings, individual supervision of clinical work, and related readings.

384 **Outpatient Psychiatry** (arr.) Sotsky
Participation as acting intern in multidisciplinary outpatient clinic team with experiences in diagnostic assessment and crisis intervention, observation of pharmacotherapy; group or family therapy supervision of clinical work and readings in field, participation in clinical case and assessment conferences and relevant resident seminars. Participation in hospital psychiatric consultation and psychiatric consultation–liaison seminars.

386 **Research Approaches to Families of Medical Patients** (5) Reiss and Staff
Introduction to theory, method, and techniques of clinical and research evaluation of families of medical patients, focus on family factors that favor or retard the patient's recovery from serious medical illness. Completion, under supervision, of a small independent project on a topic of student's choice.

387 **Research Approaches to Families of Psychiatric Patients** (arr.) Reiss and Staff
Introduction to theory, method, and techniques of clinical and research evaluation of families of psychiatric inpatients. Participation in interviewing families; reading in research literature; and completion of a small independent project on topic of student's choice.

388 **Child and Adolescent Psychiatry** (arr.) Egan and Child Psychiatry Faculty
Participation as an acting intern in child psychiatry. Consultation to pediatric wards, outpatient evaluation and treatment of selected child patients and their families, and/or inpatient child and adolescent services; eight weeks required for specialized experience in all three areas. Individualized elective program by arrangement. Assignments based on student's preference and prior experience, within limits of feasibility for elective period involved. Children's Hosp

390–93 **Extramural Psychiatry Elective** (arr.)
The department may arrange for students to spend one or more elective periods at other institutions. Information on electives at other medical schools available.

397 **Schizophrenic and Borderline Conditions** (5) Ehlers
Participation in, observation of, and study of treatment and administrative management of patients. Participation in staff meetings. Individual supervision and selected readings. 4-week elective periods. Chestnut Lodge, Rockville, Md.

406 **Psychiatric Education, Research, and Administration** (arr.) Robinowitz and Staff
Student preceptorship, practicum experience, theoretical instruction, participation in research, and individual project. Direct supervision by and close working contact with director and staff of office of education of national specialty society. Opportunity to observe operations and for contacts with leaders in field. Student gains knowledge of research and administration pertaining to women in medicine, psychiatric education, manpower development relevant to health care delivery, continuing education, federal and legislative affairs, health planning, and relation of medical education to practice. Personal interview required to plan individualized program. American Psychiatric Association.

409 **Independent Studies** (arr.) Hendren
Individualized studies, clinical training, or research experience. Selections on basis of student interest, personal interview, and available resources. Possible subjects include death and dying, suicide, medical ethics, depres-

sion, and other psychiatry and behavioral science interests of the student and available faculty

411 **Introduction to Clinical Psychiatry** (2) — Wiener, Barber, Perlin, Hendren
Students join staff member during evaluations, consultations, and discussions of readings of interest in general psychiatry. Course exposes students to inpatient, outpatient, emergency room, consultation liaison psychiatry, and current research at GWU Medical Center

412 **Application of Psychoanalytic Principles to the Practice of Medicine** (1) — Nowak
Special course designed for medical students by Extension Division of the Washington, D.C., Psychoanalytic Institute, taught by a practicing psychoanalyst on clinical faculty. Two- to 3-week advance notice required to arrange for an instructor.

413 **Identity and Role of the Physician** (1) — Robinowitz
Emphasis on the role and identity of the physician (with special emphasis on women). Done in a small group in which didactic material on the role and identity of the physician is combined with experimental models, including group dynamics. Number and time of meetings flexible.

414 **History of Mental Illness and Therapeutics** (1) — Gorelick
Consideration of the historical periods of primitive healing, Greek medicine, Arabic medicine, Christian healing, witchcraft, and key developments of the last 200 years. Student may select topic of particular interest for further study with supervisor.

415 **Individual Student Preceptorship** (1) — Hendren and Staff
First- and second-year medical students can arrange individual preceptorships other than departmental electives listed with the permission of Dr. Hendren.

419 **Seminar: Special Topics and Techniques in Family Psychotherapy** (3) — Steinglass
Advanced seminar for family therapists. The concept of the family life cycle as a framework for identifying specific developmental phases in family life. Marital therapy, family therapy with young children, sexual dysfunction, divorce, occupational crises, retirement. Phase-specific problems and specialized intervention techniques. Participants must be currently seeing families in therapy. Permission of instructor(s) required.

420 **Research Methods for the Direct Study of the Family** (3) — Reiss
Basic concepts in the design of quantitative studies of the development and function of the family. Use of theory, grounded observations, and personal experience in the design of research, analyses of verbal interaction; social systems analyses, comparative analysis of interview methods, laboratory procedures, and naturalistic observations. Prerequisite: permission of instructor. (Fall)

423 **Administrative Psychiatry** (arr.) — Arons
Exposure to the psychiatrist and administrator, concentrating on the role of the psychiatric hospital in mental health services. St. Elizabeths Hosp.

424 **Biologic Psychiatry with Emphasis on Psychopharmacology** (arr.) — Arons, Farrell
Relationship of central nervous system changes to pharmacology. Management of patients who are violent and chronically ill. St. Elizabeths Hosp.

Radiology*

Chairman: C.C. Rogers *(Acting)*

Directors of Divisions: W.W. Olmsted *(Diagnostic Radiology)*, R.C. Reba *(Nuclear Medicine)*, C.C. Rogers *(Radiation Oncology and Biophysics)*, J.R. Williams *(Radiation Physics)*

Professors: E.W. Bradley *(Research)*, D.O. Davis, E.M. Druy, W.C. Eckelman *(Nuclear Medicine)*, A.M. Lewicki, C.C. Ling, M. Majd, W.J. McSweeney, W.W. Olmsted, R.C. Reba *(Nuclear Medicine)*, S.D. Rockoff, C.C. Rogers *(Radiation Oncology)*, W.J. Rzeszotarski *(Research—Nuclear Medicine)*, B.J.L. Sauerbrunn *(Nuclear Medicine)*, V.M. Varma *(Nuclear Medicine)*, J.R. Williams *(Research)*

Clinical Professors: R.M. Allman, G.J. Augustin, J.A. Burwell, C.V. Cimmino, J.L. Doppman, E.R. Jacobs, B.T. Katzen, J.M. Korsower, J.G. Maier *(Radiation Oncology)*, J.J. Smith *(Nuclear Medicine)*, A.C. Wyman

Professorial Lecturers: S.L. Brahman, J.E. Lichtenstein

Associate Professors: S.C. Carabell, J.W. Gaskill *(Research)*, R.E. Gibson *(Research)*, D.J. Goodenough *(Radiation Physics)*, L.A. Harisiadis, M.C. Hill, T.M. Koval, C.H. Paik *(Research—Nuclear Medicine)*, B.M. Potter, K.G. Rieth

Adjunct Associate Professors: W.J. Bunnell, J.A. Deye *(Radiation Physics)*, D. Kram

Associate Clinical Professors: P.F. Abraham, L.D. Brotman, C.M. Citrin, L.M. Glassman, J.K. Hutcheson, E.V. Kotlyarov, S.N. Lee, R.J. Lull, J.D. Marriott, D.D. Maxwell, S. Mittler, B.E. Rubin, M.A. Weiss

Associate Professorial Lecturers: A.C. Brower, D.J. Curtis, J.A. Long, Jr.

Assistant Professors: H.R. Adams, J.A. Becker, D.R. Brallier, H.H. Coenen *(Visiting Research)*, T.C. Fearon, C.A. Finder, S.M. Levenson *(Research)*, B.M. Markle, J.I. Rich, A.J. Roach, S.N. Rustgi, I.J. Spiro *(Research)*, A.L. Tievsky, K.E. Weaver *(Radiation Physics)*

Adjunct Assistant Professors: F.B. Atkins, E.J. Banasiak, L.W. Busching, A. Catagnolo, M.L. Cianci, W.H. Farland, D.A. Marden, N.L. McElroy, C.E. Pickwick, M.H. Selikson *(Radiation Physics)*

Assistant Clinical Professors: J.B. Bowers, S.R. Brown, T.J. Brown, D.R. Buck, D.C.P. Chen, J.J. Conklin, R.S. Frankel, N. Ghaed *(Nuclear Medicine)*, D.S. Hartman, K. Horvath-Pushkas, M.S. Kneller, E.R. Lipsit, S.J. Pion, R.S. Pyatt, Jr., J.I. Rich, M. Rosenstein *(Radiation Physics)*, G.S. Staples, G. Tievsky, D. Van Nostrand, W.D. Wehunt, Z.R. Weinstein, R.L. White, J.W. Winebright *(Nuclear Medicine Technology)*, M.G. Wolfman

Assistant Professorial Lecturers: A.H. Dachman, A.C. Friedman

Adjunct Instructors: T.R. Fewell, M.A. Goelz, R.W. Killian, B.R. Rock, C.R. Somogyi, T.K. Stefanakos

Clinical Instructor: J.L. Murray

Special Lecturers: D.L. Daniels *(Nuclear Medicine Technology)*, L.E. Embry IV, R.W. Fay, R.P. Franco, R.D. Hicks, E.E. Jamieson, K.G. Norwood, J.A. Stickland, M.T. West

Courses numbered 40–195 are limited to students in the Associate in Science and Bachelor of Science degree programs in radiologic technology, nuclear medicine, and radiologic science and administration.

*Unless otherwise indicated, all faculty appointments are in Diagnostic Radiology

40 Clinical Training and Experience in X-ray Technology I (2) Gerber, Marriott
Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and circulatory systems, chest and abdomen radiography, orthopaedic radiography, ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy.

41 Clinical Training and Experience in X-ray Technology II (2) Gerber, Marriott
Prerequisite: Rad 40

42 Clinical Training and Experience in X-ray Technology III (2) Gerber, Marriott
Prerequisite: Rad 40, 41

43 Clinical Experience in Nuclear Medicine I (4) Reba and Staff
Practical study and supervised performance, emphasis on indications and contraindications, procedures and methods, physiological and procedural factors that may result in a false study, radiation safety techniques, preparation and development of new radiopharmaceuticals and research methodology, and administrative procedures

44 Clinical Experience in Nuclear Medicine II (5) Reba
Prerequisite: Rad 43

50 Radiographic Anatomy and Positioning I (4)

51 Radiographic Anatomy and Positioning II (4) Staff
Human anatomy and positioning as applied to radiologic technology. Structure and function of the human skeleton and topographical anatomy, both normal and pathological. Applications of these techniques are practiced in the laboratory.

52 Radiographic Anatomy and Positioning III (4) Staff
Techniques of radiography employing contrast media, fluoroscopy, spot films, body section radiography, pelvimetry, location of foreign body in the eye, and operating techniques. Prerequisite: Rad 60

53 Radiographic Anatomy and Positioning IV (4) Staff
Basic positioning techniques, including upper and lower extremities, are studied in lecture periods. Application of these techniques in the laboratory, using radiographic machines, phantoms, and film processing methods.

54 Radiographic Anatomy and Positioning V (4) Staff
Special radiographic procedures, including cerebral, abdominal, and cardiac angiography. Lecture and laboratory periods. Prerequisites: Rad 61, 71

55 Stationary and Rectilinear Imaging (3) Peters
Related anatomy, physiology, and pathology of imaging procedures, basic methodology of these and related procedures, including bone, brain, liver, liver function, bone marrow, lung, liver–lung, transmission, cardiac blood pool, cisternography, spleen, parathyroid, pancreas, lung ventilation, parotid ventriculography, miscellaneous scans, brain and cardiac flow studies.

56 Hematologic and Radionuclide Dilution Procedures (3) Peters and Staff
Related anatomy, physiology, and pathology of hematologic and radionuclide dilution procedures, basic protocol for these procedures, including plasma volume and related plasma studies, red cell volume and related red cell studies, studies of iron metabolism, and placental localization and scanning.

57 Organ Concentration–Excretion Measurements (3) Staff
Related anatomy, physiology, and pathology of organ concentration excretion measurements, procedure, including thyroid uptake and its variations, thyroid scan, metastatic chest survey, renogram, renal scan, and renal flow study.

58 **Gastrointestinal Absorption Measurements** (1) Williams
Related anatomy, physiology, and pathology of gastrointestinal absorption measurements; procedure, including fat absorption studies (triolein and oleic acid) and the three stages of the vitamin B-12 absorption study (Schilling test).

59 **Competitive Binding Radioimmunoassay** (2) Williams
Basic concepts of radioimmunoassay; basic procedure for any competitive binding radioimmunoassay. Specific concepts and procedure for T3, T4, and serum B-12 determinations, factors affecting those determinations and the interpretation of their results.

60 **Radiographic Technique** (4) Staff
The history and development of X rays and X-ray tubes and the prime factors affecting film quality. Lectures and laboratories on quality assurance. Course coordinated to provide knowledge and skills required to succeed in other technical courses.

62 **Darkroom Procedures** (2) Killian, Ethridge
Processing of film after exposure; care and handling of conventional and automatic darkroom equipment, types of film, handling, and storage, mixing and handling of chemicals and the action and quantity of these chemicals in the processing of film, effects of heat and cold on these chemicals, diagnosing improper developing techniques. Laboratory work.

65 **Basic Chemistry** (3) Williams
Introduction to basic chemistry: kinds of matter, atomic structure, the periodic table, chemical bonding, formulas and equations, solutions, acid-base reactions; introduction to organic chemistry and biochemistry, laboratory sessions.

66 **Radiopharmaceuticals** (3) Staff
Uses of radionuclides in medicine, basic principles of a Mo-99/Tc-99m generator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.

70 **Radiographic Physics I** (3) West, Goelz
Fundamental concepts of physics, including standards of measure, metric measurement, laws of motion, weight, work, power, energy, and momentum. Introduction to structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, series decay. Description and use of electrostatics and magnetism. Laboratory work.

71 **Radiographic Physics II** (4) West, Treadwell
Fundamental concepts of current flow, ohms and Joule's law, series/parallel, compound circuits, battery types and functions, metering devices, electrical safety. Description and function of electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors, applications of electronic principles to X-ray equipment and components; transformers, generators, motors, rectifiers, current control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile X-ray units. Laboratory work.

72 **Radiation Instrumentation** (5) Peters and Staff
Theoretical and practical aspects of radiation detectors; types, components, and operation of detectors; collimators; geometry; introduction to rectilinear scanning; introduction to stationary imaging; clinical orientation.

75 **Fundamentals of Atomic and Nuclear Physics** (3) Staff
Basic units, quantum theory, Bohr theory, atomic and nuclear structure, radioactivity and decay, alpha and beta particles, electromagnetic radiation, series decay, radioactive equilibrium, I.C.R.U.

80 **Mathematics of Radiology** (3) Killian and Staff
Principles of mathematics as applicable to the physics of radiologic technolo-

gy; use of logarithms, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions; linear equations in the unknown; Cartesian coordinate plane; slope of straight line; linear equations from given conditions; and graphic solution of two or more linear equations. For off-campus students only.

81 Basic Mathematics (3) Peters
Review of basic high school mathematics, basic algebra, common and natural logarithms and their manipulation, linear and logarithmic graphing, and manipulation of a log-log slide rule.

82 Applied Technical Mathematics (3) Peters
Mathematics as applicable to nuclear medicine. Basic decay formula and its variations, calculation of doses of radionuclides, basic statistics terminology, frequency distributions, confidence limits, standard error, efficient distribution of counting time, statistics relating to rectilinear and stationary imaging.

90 Medical Ethics (1) Staff
Ethics of physician-technician-patient relationships. Responsibilities, both moral and legal, to physician and patient, the rapport expected of the technologist.

91 Special Projects in Radiology (arr.) Staff
Independent study on an aspect of radiology worked out between the student and the instructor.

92 Mathematics of Radiology (3) Gaskill
Principles of mathematics as applicable to physics of radiologic technology; use of exponential and logarithm function, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions, linear equations in the unknown; Cartesian coordinate plane; slope of straight line; and linear equations from given conditions. Usage and application of calculators is stressed. Prerequisite: admission into radiological sciences undergraduate or graduate program.

93 Radiobiology and Radiation Dosimetry (3) Staff
Interaction of radiation with matter; radiation effects on molecular, cellular, tissue, and organ levels; genetic and somatic effects of ionizing radiation; classical and M.I.R.D. methods of absorbed dose calculation.

94 Radiological Safety (3) Staff
Introduction to radiation safety, units of radiation exposure and dose; licensing; NRC regulations; accountability and records, receipt, storage, handling, transportation, and disposal of radioactive materials; monitoring; shielding; dose–distance relationships; personnel dosimetry; radiation illness, radiac instruments, radiation safety clothing, radioactive "spill" procedure.

95 Radiation Safety (2) Staff
Techniques and equipment design for reducing unnecessary radiographic exposure of the patient and technologist.

96 Radiation Biology (3) Stickland
Effects of ionizing radiation on various cells, tissues, organs, and the human body as a whole, organic and inorganic molecules; the human immunity system; effects on pregnancy and relative radiosensitivity of the developing embryo; possible genetic effects of radiation; chronic and acute effects of radiation; use and history of radiation in therapy, classification of neoplasms, types of therapy units, and treatments. Prerequisites: Rad 50, 70, 71.

98 Therapy Procedures (1) Staff
Introduction to radiation therapy and radium implants. Related anatomy,

physiology, and pathology of phosphorous-32 and iodine-131 therapies and the technologist's responsibilities concerning them.

99 Alternate Imaging Systems (3) Jones
Various modalities of radiographic imaging systems and types of equipment. Intensification screens, fluoroscopy, spot filming, image intensification, cinefluoroscopy, film changes, thermography, electron radiography, and computerized axial tomography. Prerequisites: Rad 60, 71, 95.

100 Pathology (3) Staff
Radiographic pathology relevant to the radiologic technologist. Clinical description of the disease process and radiographic demonstrations.

140 Radiology Administration (4) Becker
Key areas of administration; human skills, technical skills, and conceptual awareness as they pertain to radiologic management at the department level. Traditional management concepts and models developed through modern texts and current journals that address such topics as organizational behavior, planning, and controlling. Discussion and exploration of the logistics of managing a radiology section. Prerequisites: HCS 142, 153, 154, 170.

145 Administrative Project: Diagnostic Radiology (3) Becker
For students concentrating in diagnostic radiology. Identification, development, and completion of a project for a radiology department, using administrative principles. Weekly seminars on current issues in management and leadership. To be taken with Rad 140.

147 Administrative Project: Nuclear Medicine (3) Becker
For students concentrating in nuclear medicine. Identification, development, and completion of a project for a nuclear medicine department, using administrative principles. Weekly seminars on current issues in management and leadership. To be taken with Rad 140.

149 Administrative Project: Radiation Therapy (3) Becker
For students concentrating in radiation therapy. Identification, development, and completion of a project for a radiation therapy department, using administrative principles. Weekly seminars on current issues in management and leadership. To be taken with Rad 140.

167 Radiation Physics and Safety I (3) Weaver and Rosenstein
Concepts of matter and energy and electromagnetic radiation. Mechanisms in the production of X rays and X-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effects. Radiation detection and dosimetry, roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems. Prerequisite: Rad 92.

171 Radiological Electronics and Engineering (3) McElroy
Introduction to basic electronics and the operation, limitations, use, and principles in the selection of instrumentation. Transistors, power supplies, amplifiers, major circuit components of radiation detection instruments, gamma camera and rectilinear scanners, radiotherapy orthovoltage and linear accelerators, and diagnostic radiography equipment. Prerequisite: Rad 92.

175 Physics and Radiological Imaging (3) Weaver
For students concentrating in diagnostic radiology. Image formation and transmission through radiological and related photo-optical devices, using system analysis techniques. Concepts of sensitivity, contrast, and modulation transfer functions. Description and analysis of photoreceptors, including film grids and Bucky and intensifier screens. Radiographic development process. Fluoroscopy, cineradiography, and video techniques, image storage

electronic radiography; and solid-state imaging panels. Ultrasonography and thermography. Demonstrations and experiments in control and evaluation of radiologic imaging. Prerequisite: Rad 167.

176 **Physics of Nuclear Medicine** (3) Weaver
For students concentrating in nuclear medicine. Concepts of radioactivity, including beta decay, isomeric transitions, electron capture, internal transition, alpha decay, and the auger effect. Isotopic half-life secular and transient equilibrium. Artificial transmutations, nuclear reactions, counting statistics, and selection of instrumentation. Scintillation spectrometry techniques. Rectilinear scanners, gamma camera, and computer technology in nuclear medicine. Demonstrations and experiments in control and evaluation of imaging. Prerequisite: Rad 167.

177 **Dosimetry in Radiation Therapy** (3) Ling
For students concentrating in radiotherapy. Concepts of depth dose, isodose curves, and tissue air ratios for different energies, TSD, and field size. Techniques of treatment planning for stationary, multiple, and moving portals for Co-60 and megavoltage linear accelerators. Concepts of wedge fields and compensation for multiple TSD surfaces and tissue inhomogeneities. Dosimetry of linear sources. Quimby and Paterson Parker dosimetry systems. Computer techniques in radiotherapy. Introduction to the dosimetry of electrons, neutrons, and the heavy particles. Demonstrations and experiments illustrating dosimetric principles. Prerequisite: Rad 167.

190 **Radiation Biology** (4) Staff
Radiation physics applied to biological systems; radiation chemistry of water and organic molecules; radiation effects on cells, tissues, and whole organisms; DNA damage, repair, carcinogenesis, and genetics. Risks vs. benefits; protection measures.

195 **Directed Study in Radiation Physics** (2) Weaver
Projects, in selected specialty, demonstrating applications of radiation physics, imaging, or dosimetric principles to radiographic quality control and evaluation of radiological equipment systems. Prerequisites: Rad 167; 171; 175 or 176 or 177.

383 **Clinical Radiology** (5) Wyman and Staff
Radiologic and differential diagnosis with specific emphasis on the role of diagnostic radiology in clinical problem solving. Each student is assigned a patient population in Medicine and Surgery to correlate radiologic examinations with clinical manifestations of disease. Brief clinical and radiological summaries on patients may be required. Procedures, case conferences with staff members, and interaction with medical and surgical staff. Daily lectures and departmental staff conferences. ACR Learning File and audiovisual material. 4-week elective periods. Univ. Hosp.

384 **Diagnostic Radiology** (arr.) Burwell and Staff
Participation in general radiology, fluoroscopy, and special procedures; interpretation of radiologic procedures with staff, review and study of teaching film file. Attendance at medical, surgical, and pediatric staff conferences. Fairfax Hosp.

385 **Nuclear Medicine** (arr.) Reba and Staff
Introduction to the application of radiotracer techniques in clinical medicine and biomedical research. Participation as clinical nuclear medicine intern or as research assistant. Student is encouraged to become involved with one of the research projects of the division or in an independent project, using radiotracer techniques in an investigation oriented toward pharmaceutical chemistry, computer applications, or patient care. Univ. Hosp.

386 **Radiation Oncology** (arr.) Rogers and Staff
Introduction to high-energy radiation and principles in radiation biology. Participation in management of patients with a variety of malignant

diseases by radiotherapeutic techniques; emphasis on diagnosis and prognosis. Correlative assigned reading and seminars. Univ. Hosp.

387 **Subspecialty Diagnostic Radiology** (arr.) Wyman and Staff
Subspecialty training in radiological diagnosis to prepare students for specialty medical training. Offerings include pulmonary, gastrointestinal, urologic, obstetric and gynecologic, neurologic, and pediatric subspecialties. Prerequisite: permission of department. Univ. Hosp.

389 **Diagnostic Radiology** (5) Dobbins
General radiography, concentrating on typical outpatient and emergency radiology. Nat'l. Naval Med. Center.

390–92 **Extramural Radiology Elective** (arr.)
Participation in a radiology program at another institution, dependent on written acceptance of the student by the chairman of the extramural Department of Radiology and with confirmation by the Education Director, Department of Radiology, GWU Medical Center.

400 **Diagnostic Radiology** (5) Augustin and Staff
General radiography, fluoroscopy and nuclear medicine, special procedures, ultrasound and or CT. Review and study of teaching image file. Wash. Hosp. Center.

401 **Diagnostic Radiology** (5) Brahman
Participation in general radiologic interpretation, nuclear radiology, special procedures, ultrasound, and CT. Review and study of teaching file. Daily conferences. 4-week elective periods. Walter Reed Army Med. Center.

Surgery

Chairman: R.G. DePalma
Directors of Divisions: N.T. Tsangaris *(General Surgery)*, R.S. Shapiro *(Oral Surgery)*, J.G. Randolph *(Pediatric Surgery)*, S.D. Macht *(Plastic Surgery)*, B.L. Aaron *(Thoracic and Cardiovascular Surgery)*

Professors: L.T. Bowles, G.A. Higgins, Jr., S.A. Karmi, G.S. Letterman *(Plastic Surgery)*, J.G. Randolph, P.E. Shorb, Jr., N.T. Tsangaris
Clinical Professors: N.L. Barr, Jr., D.N.F. Fairbanks, W.J. Fouty, N.H. Isaacson, J.J. McFarland, M. Mills, R.S. Page, Jr., R.E. Pumphrey, Jr., J.R. Thistlethwaite, W.M. Trible, B.M. Webb, J.J. Weinstein
Professorial Lecturer: C.O. Callender
Associate Professors: B.L. Aaron, T.C. Alford, K.D. Anderson, G.W. Geelhoed, J.M. Giordano, K.M. Grundfast, F.M. Midgley, H.C. Pierpont, S.A. Rosenberg, L.W. Thompson, H.H. Trout III
Associate Clinical Professors: F.B. Brandt, J.W. Canter, P.J. Corso, S. Epstein, B.A. Feldman, M.J. Fischer, J.M. Garcia, I.S. Jaffee, J.M. Keshishian, S.M. Kirson, M.E. Krucoff, J.L. Levine, J.A. Sabri, M.A. Schurter, C.A. Silva, A. Small, N.P.D. Smyth
Associate Professorial Lecturer: L.E. Church *(Oral Surgery)*
Assistant Professors: R.C. Cochran, M.R. Eichelberger, J.R. Fletcher, P.C. Guzzetta, S.D. Macht, G.J. Milmoe, C.A. Peck, Jr., S.D. Pett, D.C. Watson, Jr.
Assistant Clinical Professors: E.J. Alpher, J.R. Appleton, R.J. Bohys, W.R. Bond, Jr., B.D. Burtoff, R.R. Cameron, M.H. Cohen, D.E. Feldman, R.L. Flax, B.F. Frankel *(Oral Surgery)*, J.M. Gitelman *(Oral Surgery)*, L.W.

Gray, Jr., E.J. Hager, E.D. Hanowell, I. Harrison, M.H. Jordan, S.M. Knoll, L. Kozloff, R.D. Kurstin, B.J. Levin, C.L. Magassy *(Plastic Surgery)*, G.F. Miller, Jr., J.J. O'Connor, N.A. Odyniec, J.F. Schanno, S.B. Schreiber, B.S. Teunis, P. Zamick *(Plastic Surgery)*

Adjunct Instructors: P.H.J. Krogh, C.C. Lindquist

Clinical Instructors: K.L. Alley, N.M. Azzato, J. Bloom, I.N. Brecher, K.F. Cheyney, R.L. Cohen, P.A. Coyne, L.L. Deitz, W.H. Ferguson, P.J. Galipeau, J.L. Hanscom, S. Holen *(Periodontics)*, S.B. Hopping, D. Isaacson, M.L. Kolkin, W.Y. Marcus, B. Modlin, S. Oristian, A.M. Philip, J.H. Reisin, G. Rothman, G.I. Scarzella, H.H.E. Scheidemandel, R.S. Siegel *(Oral Surgery)*, H.C. Stein, I.R. Tannebaum, H.S. Tidler, A.J. Wilets, H.M. Wise, Jr.

Special Lecturers: W.L. Amoroso, Jr., J.H. Bayly, J.A. Dowling, J.S. Eng, T.L. Koury, I. Miller, R.J. Oldham, D. Powers, S.D. Protos, R.N. Scott, M.D. Sulkin, B. Teimourian

302 **Clinical Clerkship in Plastic Surgery** (3) Staff
Two-week elective periods. Univ. Hosp

303 **Clinical Clerkship** (10) Staff
Required for medical students. Eight weeks at Univ. Hosp. and Nat'l. Naval Med. Center

350 **Otolaryngology** (arr.) Fairbanks and Staff
Participation in care of outpatients and inpatients; diagnosis, therapy, rounds, and conferences. Private office practice

351 **Otolaryngology, Head, and Neck Surgery** (arr.) Hauck and Staff
Participation in the clinical service at Walter Reed Army Medical Center, involving inpatients and outpatients

352 **Otolaryngology** (arr.) Hirokawa and Staff
Inpatient and outpatient rotations; operating room experience. Nat'l. Naval Med. Center.

376 **Advanced Surgery** (5) Tsangaris
Participation in total patient care, including operative procedures under close supervision. 4-week elective periods arranged at affiliated hospitals.

378 **Intensive Care Unit** (5) Fouty and Staff
Introduction to the management of acutely ill surgical patients, including cases involving trauma; neurosurgery; and cardiovascular–thoracic, abdominal, and orthopaedic surgery. 4-week elective periods. Wash. Hosp. Center.

379 **Transplantation Immunology** (arr.) Geelhoed
Clinical renal transplantation and preservation. Daily teaching rounds, literature conference, seminar presentation, weekly surgical–medical nephrology rounds. Univ. Hosp.

383 **Endocrine Surgery** (arr.) Geelhoed
Management of endocrine disorders. Emphasis on control of hyperfunction and neoplasms of the thyroid, parathyroid, adrenal, and pancreatic islet cell glands. Videotaped classic endocrine problems, library and laboratory research, and clinical exposure to surgical endocrinology. Univ. and V.A. Hosps.

384 **Thoracic/Cardiovascular Surgery** (5) Aaron, Hix
Basic principles used in thoracic and cardiovascular surgery. 4-week elective periods. Univ. Hosp. and Clinic.

385 **Plastic and Reconstructive Surgery** (arr.) Macht
Preoperative and postoperative care, operating room procedures, clinical activities, conferences. Trauma, hand surgery, congenital anomalies, neoplasms in children, and maxillofacial trauma. Children's Hosp.

389 **Surgical Preceptorship** (arr.) Tsangaris
Care of general surgical patients as seen in private practice

390–95 **Extramural Surgery Elective** (arr.)
The department arranges for students to spend one or more elective periods at other institutions. Students must have the approval of the chairman of the department.

400 **Special Programs** (arr.) Tsangaris
Special elective to be developed and arranged in consultation with department chairman.

401 **Peripheral Vascular Surgery** (arr.) Keshishian and Staff
Introduction to the physiologic basis for an approach to peripheral vascular disease. Initial assignment to the chief cardiovascular technician in the noninvasive laboratory. Modern diagnostic techniques, including observations of contrast arteriography. Following a patient from admission, through surgery, and into the postoperative period. Opportunity to participate in course director's private office practice. Wash. Hosp. Center.

402 **Burns** (arr.) Jordan
Participation in a nine-bed dedicated burn unit with an associated step-down unit for recuperating burn patients; 100 major burn patients admitted to unit every year. Full-time attending.

403 **Peripheral Vascular Surgery** (5) Giordano and Staff
General introduction to peripheral vascular surgery. Time spent in Vascular Laboratory, evaluating patients and learning the basic arteriovenous and cerebrovascular examinations, and in office practice of Dr. Joseph Giordano and Dr. Hugh H. Trout, seeing vascular patients. Assignment to one of the surgical services, participating in management and care of patients and attending to them in the operating room, if appropriate, including general vascular and surgical patients.

404 **Experimental Surgery** (arr.) Geelhoed
Research projects in surgical research laboratories, employing animal models and experimental operative procedures in physiologic investigations. Emphasis on design of experiments, performance of experimental surgical techniques, precision in laboratory data gathering, and analysis of data. Areas of investigation include surgical endocrinology, transplantation, and cardiovascular physiology.

405 **Hand Surgery Clinic** (arr.) Seyfer
Participation in care of patients of all ages, working closely with hand surgeons from Orthopaedic and Plastic Surgical Services. Basic approaches to diagnosis and treatment of a wide variety of hand disorders, including nerve injuries, arthritic conditions, congenital anomalies, fractures, vascular problems, and reconstructive techniques for these problems. Exposure to microsurgery. Participation in clinics, conferences, ward rounds, and operating room. Walter Reed Army Med. Center.

406 **Plastic Surgery Clinic** (arr.) Seyfer
Participation in care of patients and exposure to a wide variety of surgical problems in all age groups, ranging from congenital anomalies such as cleft lip palate and syndactyly to complex reconstructive surgery for abdominothoracic wall defects, head and neck cancer, and extremity reconstruction. Cosmetic surgery involving face, eyelids, and other areas. Participation in combined orthopaedic plastic surgery hand service. Experience in evaluation and treatment of conditions related to the upper extremity. Research opportunities. Assistance in microsurgical laboratory on a regular basis. Walter Reed Army Med. Center.

Urology

Chairman: H.C. Miller, Jr.

Professors: A.B. Belman, S.I. Karmi, H.C. Miller, Jr.
Clinical Professors: F.J. Frensilli, W.D. Jarman, B.T. Mittemeyer, F.T. Reuter
Associate Professors: H. Bensimon, E.J. Kass
Associate Clinical Professors: W.L. Banfield, M. Edson, H.A. Goldberg, J.C. Kenealy, H.J. Klapproth, A.M. Kwart, C. Rodriguez, H.S. Semerjian
Assistant Clinical Professors: J.B. Alperstein, M.E. Beall, M.P. Berger, W.L. Glover, Jr., P.L. Gross, F.B. Hendricks, S.O. Kazmi, J.M. Lebowitz, R.C. Rhame, H. Salcedo, D.T. Schwartz, D.M. Seitzman, I. Shuman, E.H. Soifer, I.J. Spence, R.E. Ware, I.S. Young
Clinical Instructors: E.G. Abramson, R.M. Berger, H.E. Bondy, N.L. Constantinople, J.D. Francis, T.E. Kasper, M.I. Murdock, P.I. Shah, S.L. Werner, A.J. Willis, G.W.-K. Yu

302 **Required Clinical Clerkship** (3) Karmi
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies; endoscopy and surgery; collateral reading; weekly staff conference. Univ., V.A., Fairfax, and Children's Hosps.

381 **Clinical Urology** (5) Karmi and Staff
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery; collateral reading; weekly staff conference. 4-week elective periods. Univ., V.A., Children's and Fairfax Hosps.

382 **Clinical Urology** (arr.) Bensimon
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies; endoscopy and surgery; collateral reading, weekly staff conference. V.A. Hosp.

390–92 **Extramural Elective** (arr.)
With permission the student can participate in a (reviewed) urology clerkship in another medical center.

Faculty and Staff of Instruction*

Emeriti

Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Louis Katz Alpert, *Professor Emeritus of Medicine*
B.S. 1928, M.D. 1932, Yale University

William Staton Anderson, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University

Thomas McPherson Brown, *Professor Emeritus of Medicine*
B.A. 1929, Swarthmore College; M.D. 1933, Johns Hopkins University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University

Jeremiah Keith Cromer, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1929, B.A. 1931, George Washington University

Leon Richard Culbertson, *Professor Emeritus of Urology*
B.S., M.D. 1936, University of Virginia

Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1916, Western Maryland College; M.D. 1920, Johns Hopkins University

Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1931, Case Western Reserve University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1934, George Washington University

Clayton Bernard Ethridge, *Professor Emeritus of Medicine*
M.D. 1933, University of Virginia

John McCallum Evans, *Professor Emeritus of Medicine*
B.A. 1935, Denison University; M.D. 1939, State University of New York at Buffalo

* The Faculty and Staff of Instruction listed here and at the head of each department represent appointments current as of July 1982. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.

James Joseph Feffer, *Professor Emeritus of Clinical Engineering and of Medicine*
B.A. 1935, Indiana University; M.D. 1938, Indiana University at Indianapolis

Clarence Kendall Fraser, *Professor Emeritus of Clinical Obstetrics and Gynecology*
Ph.B. 1931, College of the Holy Cross; M.D. 1935, Tufts University

James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia of Virginia Commonwealth University

Robert Henry Groh, *Professor Emeritus of Clinical Neurology*
B.S. 1935, M.D. 1937, University of Pittsburgh

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Robert Sexton Higdon, *Professor Emeritus of Dermatology and of Child Health and Development*
B.S. 1933, Millsaps College; M.D. 1937, Tulane University

Vincent Michael Iovine, *Professor Emeritus of Clinical Surgery*
B.S. 1931, Manhattan College; M.D. 1935, Columbia University

Paula Reines Kaiser, *Associate Professor Emeritus of Anesthesiology*
M.B., Ch.B. 1936, University of St. Andrews, Scotland; M.D. 1937, State University of New York

Hayden Kirby-Smith, *Professor Emeritus of Clinical Dermatology*
B.S. 1927, University of the South; M.D. 1937, George Washington University

Calvin Trexler Klopp, *Professor Emeritus of Surgery*
B.A. 1934, Swarthmore College; M.D. 1938, Harvard University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Reginald Spencer Lourie, *Professor Emeritus of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.S. 1930, Cornell University; M.D. 1936, State University of New York Downstate Medical Center; Med.Sc.D. 1941, Columbia University

Benjamin Manchester, *Professor Emeritus of Clinical Medicine*
M.D. 1935, George Washington University

Joseph Francis Ney, *Professor Emeritus of Clinical Medicine*
B.S. 1931, University of Virginia; M.D. 1935, Harvard University

Margaret Mary Nicholson, *Professor Emeritus of Clinical Pediatrics*
B.A. 1922, M.D. 1925, George Washington University

George Nordlinger, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1918, M.D. 1922, George Washington University

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Leonard Theodore Peterson, *Professor Emeritus of Clinical Orthopaedic Surgery*
B.A., B.S. 1928, M.D. 1931, University of Minnesota

Hubert Vincent Pipberger, *Professor Emeritus of Clinical Engineering and of Medicine*
B.A. 1938, Deutsches Kollege, Germany; M.D. 1951, Rheinische Friedrich Wilhelms University, Germany

Herbert Pollack, *Professor Emeritus of Clinical Medicine (Biochemistry)*
B.A. 1925, Washington and Lee University; M.D. 1929, Cornell University; Ph.D. 1933, University of Minnesota

Lawrence Elias Putnam, *Professor Emeritus of Clinical Medicine*
B.A. 1930, M.D. 1934, Harvard University

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Benjamin Rones, *Professor Emeritus of Clinical Ophthalmology*
B.A. 1922, M.D. 1926, Johns Hopkins University

Ernest Alfred Watson Sheppard, *Professor Emeritus of Clinical Ophthalmology*
M.D., C.M. 1926, Queens University, Canada

Harold Stevens, *Professor Emeritus of Neurology*
B.S. 1933, Pennsylvania State University; M.A. 1934, Ph.D. 1937, M.D. 1941, University of Pennsylvania

Donald Harrison Stubbs, *Professor Emeritus of Clinical Anesthesiology*
B.A. 1929, M.A. 1931, M.D. 1932, George Washington University

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Janet Graeme Travell, *Professor Emeritus of Clinical Medicine*
B.A. 1922, Wellesley College; M.D. 1926, Cornell University

Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

John Augustine Washington, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1924, Virginia Military Institute; B.S. 1926, University of Virginia; M.D. 1930, Johns Hopkins University

James Winston Watts, *Professor Emeritus of Neurological Surgery*
B.S. 1924, Virginia Military Institute; M.D. 1928, University of Virginia

Richard Wallace Wilkinson, *Professor Emeritus of Clinical Ophthalmology*
B.A. 1925, M.D. 1928, George Washington University; M.S. in Med. 1932, University of Pennsylvania

Jonathan Marshall Williams, *Professor Emeritus of Clinical Neurological Surgery*
B.S. in Med. 1936, Loyola University of Chicago; M.D. 1938, University of Chicago

Active

Benjamin Larry Aaron, *Associate Professor of Surgery*
B.A. 1954, University of Missouri; M.D. 1958, University of Texas Medical Branch at Galveston

Jeffrey Allen Abend, *Clinical Instructor in Orthopaedic Surgery*
A.B. 1970, Case Western Reserve University; M.D. 1974, State University of New York Upstate Medical Center

Andreas Andrew Abraham, *Associate Professor of Pathology*
M.D. 1953, University of Szeged, Hungary

Kristof Abraham, *Associate Clinical Professor of Neurology*
M.D. 1952, University of Budapest, Hungary

Palma Feheruari Abraham, *Associate Clinical Professor of Radiology*
M.D. 1954, University of Budapest, Hungary

Michael David Abramowitz, *Associate Professor of Anesthesiology and of Child Health and Development*
M.B., Ch.B. 1972, University of Witwatersrand, South Africa

Charles Barrett Abrams, *Assistant Clinical Professor of Medicine*
B.S. 1967, Bethany College; M.D. 1971, West Virginia University

Edward Gerald Abramson, *Clinical Instructor in Urology*
B.A. 1962, University of Pennsylvania; M.D. 1967, University of Virginia

Fred Paul Abramson, *Professor of Pharmacology*
A.B. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Leela A. Achankunju, *Clinical Instructor in Medicine*
M.B., B.S. 1973, Kottayam Medical College, India

H. Richard Adams, *Assistant Research Professor of Radiology*
B.A. 1960, Columbia Union College; M.S. 1970, American University

John Pletch Adams, *Professor of Orthopaedic Surgery and of Child Health and Development; Chairman of the Department of Orthopaedic Surgery*
B.S. 1943, University of Missouri; M.D. 1945, Washington University

Edward Adelson, *Clinical Professor of Medicine*
B.S. 1943, M.D. 1947, Tufts University

Mohan Teckchand Advani, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, Punjab University, India; M.B., B.S. 1960, Osmani University, India; D.P.M. 1964, Mysore University, India

Lewis Francis Affronti, *Professor of Microbiology; Chairman of the Department of Microbiology*
A.B. 1950, A.M. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

Brent Roger Ain, *Assistant Clinical Professor of Orthopaedic Surgery*
A.B. 1967, University of Rochester; M.D. 1972, Tulane University

Oliver Alabaster, *Associate Professor of Medicine*
M.B., B.S. 1966, University of London, England; M.R.C.S., L.R.C.P. 1966, Royal College of Physicians and Surgeons, England

Julio Estuardo Alarcon, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1966, University of Trujillo, Peru

Chalom A. Albert, *Assistant Clinical Professor of Anesthesiology*
B.A. 1949, M.D. 1953, American University of Beirut, Lebanon

Dan George Albert, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1938, Ohio State University; M.D. 1950, State University of New York Upstate Medical Center

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Morris Sheldon Albert, *Assistant Clinical Professor of Child Health and Development*
A.B. 1956, Harvard University; M.D. 1960, Boston University

Solomon Naphtali Albert, *Associate Clinical Professor of Anesthesiology*
B.A. 1936, M.D. 1940, American University of Beirut, Lebanon

Julia W. Albright, *Associate Research Professor of Microbiology*
B.S. 1962, East Tennessee State University; M.S. 1972, University of Akron; Ph.D. 1978, Indiana State University

Nilda Alcasabas-Yadao, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1962, University of Santo Tomas, Philippines

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad, Iraq; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University

Stewart Leonard Aledort, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1958, City University of New York, Queens College; M.S. 1960, University of Connecticut; M.D. 1964, Yeshiva University

Elliot Aleskow, *Clinical Instructor in Medicine*
B.S. 1973, M.D. 1977, University of Maryland

Theodore Crandall Alford, *Associate Professor of Surgery*
A.B. 1944, Haverford College; M.D. 1947, Johns Hopkins University

Frank Duane Allan, *Professor of Anatomy; Director of Audiovisual Education, Medical Center*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University

Leonard William Allen, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, City University of New York, Brooklyn College; M.A. 1953, City University of New York, City College; Ph.D. 1958, University of Denver

Katherine Louise Alley, *Clinical Instructor in Surgery*
B.A. 1970, University of Arkansas; M.D. 1974, George Washington University

George Allanmoore Alleyne, *Visiting Professor of Medicine*
M.B., B.S. 1957, University of the West Indies, Barbados; M.D. 1965, University of London, England

Robert Mayer Allman, *Clinical Professor of Radiology*
B.S. 1953, Dickinson College; M.D. 1957, Thomas Jefferson University

Melvin Gustavus Alper, *Clinical Professor of Ophthalmology and of Neurological Surgery*
B.A. 1943, M.D. 1945, University of Virginia

Joel Barry Alperstein, *Assistant Clinical Professor of Urology*
B.S. 1961, M.D. 1967, University of Maryland

Hubert Joseph Alpert, *Clinical Instructor in Medicine*
M.D. 1962, University of Illinois

Seymour Alpert, *Professor of Anesthesiology; Vice President for Development*
A.B. 1939, Columbia University; M.D. 1943, State University of New York Downstate Medical Center

Elliott Joel Alpher, *Assistant Clinical Professor of Surgery (Oral Surgery)*
B.S. 1961, University of Maryland; D.D.S. 1965, Georgetown University

Michael Francis Altieri, *Instructor in Child Health and Development*
B.A. 1973, Colgate University; M.D. 1977, George Washington University

Alice Hackney Altstatt, *Associate Professor of Anesthesiology*
B.A. 1949, Bryn Mawr College; M.A. 1952, M.D. 1956, Vanderbilt University

Antonina Neri Amigable, *Assistant Professor of Medicine*
M.D. 1966, Cebu Institute of Technology, Philippines

Sirus C. Amiri, *Assistant Clinical Professor of Child Health and Development*
M.D. 1956, University of Tehran, Iran

Bruce Jorge Ammerman, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1969, Case Western Reserve University; M.D. 1972, George Washington University

Harvey Hirsch Ammerman, *Clinical Professor of Neurological Surgery*
B.S. 1939, M.D. 1943, George Washington University

Richard Gene Ammerman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Yale University; M.D. 1968, Tufts University

William Louis Amoroso, Jr., *Special Lecturer in Surgery*
M.D. 1945, George Washington University

Theodore H. Anders, *Associate Clinical Professor of Child Health and Development*
B.A. 1952, M.D. 1956, University of Rochester

Andrew Stephen Anderson, *Assistant Professor of Anesthesiology*
A.B. 1966, King College; M.Phil. 1969, Ph.D. 1971, Yale University; M.D. 1976, University of Tennessee

Daniel Stonewall Anderson, *Assistant Clinical Professor of Health Care Sciences*
M.A. 1964, University of Oklahoma; M.D. 1972, M.S. 1972, University of Arkansas

Elizabeth Potts Anderson, *Professorial Lecturer in Biochemistry*
A.B. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1950, Stanford University

Frank Hughes Anderson, *Assistant Clinical Professor of Neurology*
B.A. 1966, M.D. 1970, Harvard University

James Edward Anderson, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1955, Union College, Nebraska; M.D. 1965, Loma Linda University

Kathryn Duncan Anderson, *Associate Professor of Surgery and of Child Health and Development*
B.A. 1961, M.A. 1964, Cambridge University, England; M.D. 1964, Harvard University

Mavis Fay Anderson, *Assistant Clinical Professor of Obstetrics and Gynecology*
L.R.C.P.&S. 1952, Royal College of Surgeons, Edinburgh

Rebecca Jane Anderson, *Associate Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1975, Georgetown University

John Lawrence Angel, *Professorial Lecturer in Anatomy and Anthropology*
A.B. 1936, Ph.D. 1942, Harvard University

William Leighton Anixter, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1977, George Washington University

Tatiana T. Antonovych, *Professorial Lecturer in Pathology*
M.D. 1941, University of Vienna, Austria

James Richard Appleton, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.A. 1957, University of Iowa; M.D. 1961, University of Maryland

Aram Albert Arabian, *Assistant Professor of Medicine*
A.B. 1965, Boston University; M.D. 1975, Brown University

Marta Ewa Archutowska-Kempka, *Adjunct Instructor in Neurology*
M.D. 1971, Higher School of Medicine, Poland

Irwin H. Ardam, *Assistant Clinical Professor of Medicine*
A.B. 1948, New York University; M.D. 1954, New York Medical College

Joseph Ardizzone, *Assistant Professor of Medicine*
B.S. 1949, Medical College of Virginia of Virginia Commonwealth University

Bryan Arling, *Associate Clinical Professor of Medicine*
B.A. 1965, University of Minnesota; M.D. 1969, Harvard University

Mansour Farid Armaly, *Professor of Ophthalmology; Chairman of the Department of Ophthalmology*
B.A. 1947, M.D. 1952, American University of Beirut, Lebanon; M.S. 1957, University of Iowa

Vernon W. Armbrustmacher, *Professorial Lecturer in Neurological Surgery*
M.D. 1964, University of Michigan

Bernard Sol Arons, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1969, Oberlin College; M.D. 1973, Case Western Reserve University

Ronald W. Asay, *Adjunct Associate Professor of Health Care Sciences*
M.D. 1976, University of Rochester

Philip Assatourians, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Tehran, Iran

Emmanuel Atiemo, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.B., B.S. 1970, Ghana Medical School

Francis Bernard Atkins, *Adjunct Assistant Professor of Radiology*
B.S. 1968, Pratt Institute; M.S. 1971, Rutgers—The State University; Ph.D. 1978, University of Chicago

Gilbert Paul August, *Associate Professor of Child Health and Development*
B.S. 1958, City University of New York, City College; M.D. 1962, New York University

Gunter Josef Augustin, *Clinical Professor of Radiology*
M.D. 1952, University of Heidelberg, West Germany

Gordon B. Avery, *Professor of Child Health and Development*
A.B. 1953, Harvard University; M.D. 1958, Ph.D. 1959, University of Pennsylvania

Benjamin Avrunin, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1963, Georgetown University; M.D. 1978, Tulane University

Julius Axelrod, *Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, George Washington University

Nicholas Michael Azzato, *Clinical Instructor in Surgery*
B.S. 1945, M.D. 1947, University of Chicago

Silas M. Babin, *Assistant Clinical Professor of Medicine*
M.D. 1951, Louisiana State University, New Orleans

Leonard Bachman, *Clinical Professor of Anesthesiology and of Child Health and Development*
B.S. 1946, Franklin and Marshall College; M.D. 1949, University of Maryland

Beverly T. Backus, *Assistant Research Professor of Microbiology*
B.A. 1962, University of California, Berkeley; M.S. 1967, Ph.D. 1976, George Washington University

Robert Emil Badwey, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1955, Franklin and Marshall College; M.D. 1959, University of Pittsburgh

Alfred Baer, *Clinical Professor of Medicine*
A.B. 1942, Ohio State University; M.D. 1945, Johns Hopkins University

Duane Charles Bailey, *Adjunct Instructor in Health Care Sciences*
B.S. 1976, Alderson-Broaddus College

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

William Otis Bailey, Jr., *Associate Clinical Professor of Medicine*
M.D. 1940, George Washington University

William Prentice Baker, *Professor of Medicine*
B.S. 1949, Indiana University; M.S. 1953, Ph.D. 1955, Michigan State University; M.D. 1959, University of Michigan

Guillermo Alfredo Balfour, *Associate Clinical Professor of Child Health and Development*
M.D. 1959, University of Buenos Aires, Argentina

Eugene Joseph Banasiak, *Adjunct Assistant Professor of Radiology*
B.S. 1971, Rutgers—The State University

Bernard Alvin Band, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1952, B.S. 1954, George Washington University; M.D. 1959, Howard University

William Landon Banfield, *Associate Clinical Professor of Urology*
A.B. 1954, Princeton University; M.D. 1958, George Washington University

Herbert Stuart Block Baraf, *Assistant Clinical Professor of Medicine*
B.S. 1969, University of Michigan; M.D. 1973, State University of New York Downstate Medical Center

Joan K. Barber, *Associate Professor of Psychiatry and Behavioral Sciences*
B.A. 1946, Wellesley College; M.D. 1949, Cornell University

Lewellys Franklin Barker, *Associate Clinical Professor of Medicine*
A.B. 1955, Princeton University; M.D. 1959, Johns Hopkins University

Ann Birnbaum Barnet, *Associate Professor of Neurology and of Child Health and Development*
A.B. 1951, Sarah Lawrence College; M.D. 1956, Harvard University

Ida Sue Baron-Starke, *Associate Professor of Neurological Surgery and of Child Health and Development*
B.S. 1968, Cornell University; M.A. 1972, Ph.D. 1976, University of Maryland

Walter Erik Barquist, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, George Washington University; M.D. 1969, New York University

Norman Lee Barr, Jr., *Clinical Professor of Surgery (Otolaryngology)*
B.A. 1959, Princeton University; M.D. 1965, Georgetown University

S. Otesia Barr, *Clinical Instructor in Child Health and Development*
B.A. 1970, Mount Holyoke College; M.S. 1973, Howard University; M.D. 1977, University of Pennsylvania

Solomon Efrem Barr, *Associate Clinical Professor of Medicine*
B.A. 1951, M.D. 1954, George Washington University

John William Barrett, *Assistant Clinical Professor of Neurological Surgery*
M.D. 1958, George Washington University

Robert Henry Barter, *Professor of Obstetrics and Gynecology*
B.S. 1937, M.D. 1940, University of Wisconsin

Robert Lewis Barth, *Adjunct Assistant Professor of Anesthesiology*
B.A. 1966, Yale University; M.D. 1970, University of Pennsylvania

Werner Franklin Barth, *Professor of Medicine*
B.A. 1956, Columbia University; M.D. 1960, Yeshiva University

Edward L. Bartlett, Jr., *Assistant Professor of Child Health and Development*
A.B. 1968, College of the Holy Cross; M.D. 1972, Northwestern University

Peter Basch, *Clinical Instructor in Medicine*
B.A. 1974, Trinity College, Connecticut; M.D. 1978, George Washington University

Ronald Stephen Bashian, *Assistant Clinical Professor of Child Health and Development*
B.A. 1968, Amherst College; M.D. 1972, State University of New York Downstate Medical Center

Constance Urciolo Battle, *Professor of Child Health and Development*
B.A. 1963, Trinity College, District of Columbia; M.D. 1967, George Washington University

William Irving Bauer, *Associate Clinical Professor of Medicine*
B.S. 1945, M.D. 1950, University of Michigan

John Henry Bayly, *Special Lecturer in Surgery and in Child Health and Development*
B.S. 1936, Rensselaer Polytechnic Institute; M.D. 1940, Georgetown University

Michael Edgar Beall, *Assistant Clinical Professor of Urology*
B.A. 1968, Ohio Wesleyan University; M.D. 1972, George Washington University

Barbara Louise Bean, *Assistant Professor of Pharmacology*
B.S. 1970, University of Surrey, England; Ph.D. 1976, University of London, England

Lillian McLean Beard, *Associate Clinical Professor of Child Health and Development*
B.S. 1965, M.D. 1970, Howard University

Harry Carl Beaver, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1959, Wheaton College; M.D. 1963, George Washington University

Arthur Abbe Becker, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, City University of New York, City College; M.D. 1961, University of Iowa

Joan Alaine Becker, *Assistant Professor of Radiology (Allied Health)*
B.S. 1976, Ohio State University; M.B.A. 1981, George Washington University

Kenneth Louis Becker, *Professor of Medicine*
A.B. 1952, University of Michigan; M.D. 1956, New York Medical College; Ph.D. 1963, University of Minnesota

Matthew Joseph Becker, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1971, Massachusetts Institute of Technology; M.D. 1974, Duke University

Harry James Beecham III, *Adjunct Assistant Professor of Health Care Sciences*
A.B. 1970, Asbury College; M.D. 1974, Medical College of Georgia

Edward Arthur Beeman, *Assistant Clinical Professor of Medicine*
B.A. 1943, Harvard University; M.D. 1947, Boston University; M.S. 1956, University of Minnesota

Malcolm Sydney Beinfield, *Associate Clinical Professor of Health Care Sciences*
B.A. 1942, Yale University; M.D. 1945, State University of New York Downstate Medical Center

Gustavo Sastrano Belaval, *Associate Clinical Professor of Medicine*
M.D. 1942, George Washington University

Samuel Michael Belinsky, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1955, University of Bridgeport; M.D. 1959, George Washington University

A. Barry Belman, *Professor of Urology and of Child Health and Development*
B.A. 1960, University of Arizona; M.D. 1964, M.S. 1969, Northwestern University

Carol Laura Bender, *Clinical Instructor in Medicine*
B.S. 1965, Cornell University; M.A. 1966, Columbia University; M.D. 1972, State University of New York Upstate Medical Center

Ruth Boschwitz Benedict, *Associate Clinical Professor of Medicine*
B.A. 1935, Wellesley College; M.D. 1939, New York University

Howard Jay Bennett, *Assistant Professor of Health Care Sciences and of Child Health and Development*
B.S. 1972, University of Maryland; M.D. 1977, George Washington University

Linda Anne Marshall Bennett, *Associate Research Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Clarion State College; M.A. 1966, Indiana University; Ph.D. 1976, American University

Hector Bensimon, *Associate Professor of Urology*
M.D. 1946, Buenos Aires Medical School, Argentina

Luis Felipe Bentolila, *Assistant Clinical Professor of Medicine*
M.D. 1967, University of Buenos Aires, Argentina

Barry Bernard Bercu, *Assistant Research Professor of Child Health and Development*
B.S. 1965, University of Maryland; M.D. 1969, University of Maryland at Baltimore

Robert Allen Berenson, *Assistant Clinical Professor of Medicine and of Health Care Sciences*
B.A. 1968, Brandeis University; M.M.S. 1970, Rutgers, The State University; M.D. 1972, City University of New York, Mount Sinai School of Medicine

Myron Paul Berger, *Assistant Clinical Professor of Urology*
B.S. 1960, M.D. 1964, Georgetown University

Robert Martin Berger, *Clinical Instructor in Urology*
B.A. 1972, State University of New York at Binghamton; M.D. 1976, State University of New York Upstate Medical Center

Eric Charles Bergman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1968, Duke University; M.D. 1973, University of Pennsylvania

Gary Jay Bergman, *Clinical Instructor in Child Health and Development*
B.A. 1972, State University of New York at Binghamton; M.D. 1976, City University of New York, Mount Sinai School of Medicine

Sanders Harris Berk, *Assistant Clinical Professor of Dermatology, of Medicine, and of Child Health and Development*
B.S. 1965, M.D. 1969, University of Maryland

David Kip Berler, *Assistant Clinical Professor of Ophthalmology*
A.B. 1955, M.D. 1958, Cornell University

Cheston Milton Berlin, *Special Lecturer in Child Health and Development*
B.A. 1958, Haverford College; M.D. 1962, Harvard University

Sidney Berman, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1928, M.D. 1932, Georgetown University

Howard Nathan Bernstein, *Assistant Clinical Professor of Ophthalmology*
B.S. 1953, Bucknell University; M.D. 1957, State University of New York Downstate Medical Center

Jerald Jack Bernstein, *Research Professor of Neurological Surgery and of Physiology*
B.A. 1955, City University of New York, Hunter College; M.S. 1957, Ph.D. 1959, University of Michigan

Lionel Mandel Bernstein, *Clinical Professor of Medicine*
B.S. 1944, M.D. 1945, M.S. 1951, Ph.D. 1954, University of Illinois

M. Victor Berrett, *Adjunct Associate Professor of Health Care Sciences*
B.S. 1968, M.S. 1969, Utah State University; Ph.D. 1973, University of Iowa

John David Berryman, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1962, Swarthmore College; M.S. 1964, Case Western Reserve University; M.D. 1967, University of Virginia

Stephen Charles Beuttel, *Special Lecturer in Health Care Sciences*
B.S. 1967, Wake Forest University; M.D. 1971, Duke University

Christopher Theodore Bever, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1940, M.D. 1943, Harvard University

Maya C. Bhatia, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1966, Bombay University, India

Lewis Henry Biben, *Assistant Clinical Professor of Medicine*
M.D. 1949, Hahnemann Medical College

Charles Joel Bier, *Assistant Clinical Professor of Medicine*
A.B. 1965, M.D. 1968, George Washington University

Sanford Louis Billet, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, New York University; M.D. 1951, University of Cincinnati

Audrey Thayer Billett, *Adjunct Associate Professor of Psychiatry and Behavioral Sciences (Social Work)*
A.B. 1957, Wheaton College; M.S.S. 1959, Smith College

Helga Wagner Binder, *Assistant Professor of Child Health and Development*
M.D. 1957, Humboldt University, West Germany

Miriam Sue Birmiel, *Adjunct Instructor in Health Care Sciences*
B.S. 1976, George Washington University

Philip Stanley Birnbaum, *Professor of Health Services Administration and of Health Care Sciences; Dean of the Medical Center, for Administrative Affairs*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E. 1954, Rensselaer Polytechnic Institute

Calvin Franklin Bishop, *Clinical Professor of Pathology (Laboratory Medicine)*
B.S. 1950, Baylor University; M.D. 1953, University of Texas, Southwestern Medical School at Dallas

Edward Black, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Dickinson College; M.D. 1963, New York Medical College

Emilie Annabelle Black, *Adjunct Instructor in Child Health and Development*
B.S. 1942, M.D. 1945, George Washington University

Brian Douglas Blackbourne, *Associate Clinical Professor of Pathology (Forensic)*
M.D. 1962, University of Alberta, Canada

Jeffrey David Blake, *Special Lecturer in Child Health and Development*
B.A. 1967, Cornell University; M.M.S. 1969, Rutgers—The State University; M.D. 1971, City University of New York, Mount Sinai School of Medicine

Louis H. Bland, *Clinical Instructor in Child Health and Development*
B.S. 1971, City University of New York, City College; M.D. 1975, State University of New York Upstate Medical Center

Benjamin Cael Blatt, *Assistant Professor of Health Care Sciences and of Medicine*
A.B. 1966, Tufts University; M.A. 1968, Brandeis University; M.D. 1972, Medical College of Virginia of Virginia Commonwealth University

Vay John Blazina, *Assistant Clinical Professor of Neurology*
B.A. 1963, University of Washington; M.D. 1967, George Washington University

Ilene Sue Bloom, *Adjunct Instructor in Health Care Sciences*
B.A. 1974, University of Maryland; B.S. 1977, Johns Hopkins University

Joseph Bloom, *Clinical Instructor in Surgery*
A.B. 1949, Brown University; M.D. 1954, George Washington University

Sherman Bloom, *Professor of Pathology*
B.A. 1955, M.D. 1960, New York University

Jonathan Bloom-Feshbach, *Clinical Instructor in Psychiatry and Behavioral Sciences and in Child Health and Development*
B.A. 1974, University of Oregon; M.S. 1976, M.Phil. 1978, Ph.D. 1979, Yale University

Arthur George Blouin, *Assistant Professor of Child Health and Development*
B.A. 1974, M.A. 1975, Carleton University, Canada; Ph.D. 1980, University of Ottawa, Canada

Susan Frieda Boas, *Lecturer in Medical Technology in Pathology*
B.S. 1966, Vermont College

Robert Joel Bobys, *Assistant Clinical Professor of Surgery (Otolaryngology)*
M.D. 1963, Georgetown University

Glenn Howard Bock, *Assistant Professor of Child Health and Development*
B.S. 1971, State University of New York at Stony Brook; M.D. 1975, University of Missouri

Roger Louis O. Boeckx, *Associate Professor of Child Health and Development*
B.S. 1968, Ph.D. 1973, University of Winnipeg, Canada

George Pierce Bogumill, *Adjunct Associate Professor of Orthopaedic Surgery*
B.S. 1952, M.S. 1954, Ph.D. 1955, M.D. 1959, University of Wisconsin

Lawrence David Bohan, *Assistant Professor of Medicine*
A.B. 1958, Boston College; M.D. 1962, Tufts University

Ronald Carl Bohn, *Assistant Professor of Anatomy*
B.S. 1973, M.S. 1976, Pennsylvania State University; Ph.D. 1980, State University of New York Upstate Medical Center

Jean Crowell Bolan, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1972, M.D. 1976, University of North Carolina

William R. Bond, Jr., *Assistant Clinical Professor of Surgery (Otolaryngology) and of Child Health and Development*
B.S. 1969, Upsala College; M.D. 1973, St. Louis University

Harold Eugene Bondy, *Clinical Instructor in Urology*
B.S. 1965, Fairmont State College; M.D. 1969, West Virginia University

Willem Henry Boom, *Instructor in Medicine*
B.A. 1975, Amherst College; M.D. 1979, University of Rochester

Wynona Gottlieb Boren, *Assistant Professor of Health Care Sciences*
B.A. 1970, M.S.W. 1972, University of Maryland

Mary Ann Borengasser, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1968, University of Arkansas; Ph.D. 1974, University of Tennessee

David Gilbert Borenstein, *Assistant Professor of Medicine*
B.A. 1969, Columbia University; M.D. 1973, Johns Hopkins University

John Henry Bouma, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1948, B.S. 1949, M.B. 1952, M.D. 1953, University of Minnesota

Maxwell Boverman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1938, University of California, Berkeley; M.D. 1942, University of California, San Francisco

Joel Bruce Bowers, *Assistant Clinical Professor of Radiology*
B.A. 1965, University of Vermont; M.D. 1969, State University of New York at Buffalo

Lawrence Thompson Bowles, *Professor of Surgery; Dean of the Medical Center, for Academic Affairs*
B.A. 1953, M.D. 1957, Duke University; M.S. 1964, Ph.D. 1971, New York University

June Adeline Bradlaw, *Adjunct Assistant Professor of Microbiology*
A.B. 1958, Connecticut College; M.S. 1964, University of Maryland; Ph.D. 1974, George Washington University

Eileen Walkavich Bradley, *Research Professor of Radiology*
A.B. 1966, Anna Maria College; M.S. 1968, Sc.D. 1971, Harvard University

Sherry Lee Brahman, *Professorial Lecturer in Radiology*
B.A. 1966, Andrews University; M.D. 1970, Loma Linda University

David Ronald Brallier, *Assistant Professor of Radiology and of Child Health and Development*
B.S. 1964, University of Minnesota; M.D. 1968, University of Iowa

Carl David Brandt, *Associate Professor of Child Health and Development (Microbiology)*
B.S. 1949, University of Connecticut; M.S. 1951, University of Massachusetts; Ph.D. 1958, Harvard University

Frederick Bertram Brandt, *Associate Clinical Professor of Surgery*
B.S. 1942, M.D. 1943, University of Maryland

Martin Braun III, *Associate Professor of Dermatology and of Medicine*
M.D. 1970, University of Maryland

M. Eduardo Bravo, *Assistant Clinical Professor of Child Health and Development*
B.S. 1966, M.D. 1966, Peruvian University

Ira N. Brecher, *Clinical Instructor in Surgery*
B.S. 1959, Long Island University, C. W. Post Center; M.D. 1963, Howard University

George B. Bren, *Assistant Professor of Medicine*
B.S. 1973, M.D. 1975, Northwestern University

Gloria Godbey Brennan, *Associate Clinical Professor of Pathology*
B.A. 1949, M.D. 1952, George Washington University

Milton Wilfred Brightman, *Professorial Lecturer in Anatomy*
B.S. 1945, M.A. 1948, University of Toronto, Canada; Ph.D. 1954, Yale University

Warren Daniel Brill, *Associate Clinical Professor of Medicine*
B.S., M.D. 1944, University of Maryland

Lynn M. Broadman, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1962, Miami University; M.D. 1974, Medical College of Ohio

David Michael Brody, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1956, Harvard University; M.D. 1961, University of Virginia

Joyce Ellen Brody, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1974, M.D. 1978, University of Pennsylvania

Itzhak Brook, *Assistant Clinical Professor of Child Health and Development*
M.D. 1969, Hebrew University, Israel; M.S. 1973, Tel Aviv University, Israel

Lawrence Daniel Brotman, *Associate Clinical Professor of Radiology*
M.D. 1964, University of Michigan

Anne Clayton Brower, *Associate Professorial Lecturer in Radiology*
B.A. 1960, Smith College; M.D. 1964, Columbia University

Bertram S. Brown, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, City University of New York, Brooklyn College; M.D. 1956, Cornell University; M.P.H. 1960, Harvard University

Crawford Southwell Brown, *Clinical Professor of Dermatology*
B.A. 1946, Kenyon College; M.D. 1948, University of Michigan

Nigel Andrew Brown, *Assistant Professor of Pharmacology*
B.S. 1973, University of Leeds, England; Ph.D. 1977, University of Surrey, England

Stanton R. Brown, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.A. 1958, Rutgers—The State University; M.D. 1962, Hahnemann Medical College

Tommy Joe Brown, *Assistant Clinical Professor of Radiology*
B.S. 1961, Northeast Louisiana University; D.O. 1971, Kansas City College of Osteopathic Medicine

Douglas Spencer Brudno, *Instructor in Child Health and Development*
B.A. 1973, University of Virginia; M.D. 1977, Medical College of Georgia

Blackwell Smith Bruner, *Clinical Instructor in Ophthalmology and in Child Health and Development*
M.D. 1963, George Washington University

Philip Craig Brunschwyler, *Associate Clinical Professor of Child Health and Development*
B.A. 1951, West Virginia University; M.D. 1955, University of Maryland

Robert Wesley Bryant, Jr., *Associate Research Professor of Biochemistry*
B.S. 1966, State University of New York, College of Environmental Science and Forestry; Ph.D. 1973, Florida State University

Peter Alexander Bryce, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1974, Howard University

David Richard Buck, *Assistant Clinical Professor of Radiology*
B.S. 1970, Oklahoma State University; M.D. 1974, University of Texas Southwestern Medical School at Dallas

William Joseph Bunnell, *Adjunct Associate Professor of Radiology*
B.S. 1969, Ball State University; M.S. 1970, University of Cincinnati

James Matthew Burgin, *Assistant Clinical Professor of Child Health and Development*
B.A. 1962, Haverford College; M.D. 1966, Columbia University

Barrett Lewis Burka, *Assistant Clinical Professor of Medicine*
B.S. 1963, American University; M.D. 1973, Howard University

Boyd Lee Burris, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1952, University of Tennessee

Bruce Don Burtoff, *Assistant Clinical Professor of Surgery (Otolaryngology)*
B.A. 1970, University of Pennsylvania; M.D. 1974, George Washington University

James A. Burwell, *Clinical Professor of Radiology*
A.B. 1952, University of Pittsburgh; M.D. 1956, University of Maryland

Larry Wayne Busching, *Adjunct Assistant Professor of Radiology (Radiologic Allied Health Programs)*
B.A. 1967, University of Maryland

Sandra McGlothlin Butcher, *Adjunct Assistant Professor of Medicine*
B.A. 1957, University of California, Santa Barbara; M.S.W. 1961, University of California, Berkeley

Edward Bernard Byrd, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1963, M.D. 1965, George Washington University

Carmen V. A. Cabrera, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1932, University of Puerto Rico; M.A. in S.W. 1944, University of Chicago

Juan Bautista Calatayud, *Clinical Professor of Medicine*
M.D. 1952, University of Valencia, Spain

Clive Orville Callender, *Professorial Lecturer in Surgery*
A.B. 1959, City University of New York, Hunter College; M.D. 1963, Meharry Medical College

Ronald Ross Cameron, *Assistant Clinical Professor of Surgery*
A.B. 1953, Johns Hopkins University; M.D. 1957, University of Maryland

Jerome Wolf Canter, *Associate Clinical Professor of Surgery*
M.D. 1955, George Washington University

Mary Rose Capon, *Clinical Instructor in Medicine*
M.D. 1954, University of London, England

Steven Charles Carabell, *Associate Professor of Radiology (Radiation Oncology)*
A.B. 1969, M.D. 1973, Harvard University

David Roland Carlson, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1953, Drake University; M.D. 1960, George Washington University

Thomas Grant Carlton, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1966, San Jose State University; M.D. 1970, University of Wisconsin

David Orlo Carpenter, *Professorial Lecturer in Physiology*
B.A. 1959, M.D. 1964, Harvard University

Charles Patrick Henry Carroll, *Assistant Clinical Professor of Neurological Surgery*
A.B. 1952, Boston College; M.D. 1961, Georgetown University

David Thornhill Casey, *Assistant Clinical Professor of Ophthalmology*
B.S. 1960, University of Pittsburgh; M.D. 1964, Hahnemann Medical College

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Antoinette Castagnolo, *Adjunct Assistant Professor of Radiology*

Donald O. Castell, *Professor of Medicine*
B.A. 1958, M.D. 1960, George Washington University

Robert Lewis Castle, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1969, College of Wooster; M.D. 1976, George Washington University

Rosella Decena Castro, *Assistant Professor of Child Health and Development*
B.A. 1959, Philippine Union College; M.D. 1964, Manila Central University, Philippines

Hereward Seagrieve Cattell, *Adjunct Assistant Professor of Orthopaedic Surgery*
B.A. 1954, Amherst College; M.D. 1958, University of Rochester

James Francis Cawley, *Assistant Professor of Health Care Sciences*
B.A. 1970, St. Francis College, Pennsylvania; B.S. 1974, Touro College; M.P.H. 1979, Johns Hopkins University

Marvin Chadab, *Assistant Clinical Professor of Dermatology*
B.A. 1968, City University of New York, Brooklyn College; M.D. 1972, Yeshiva University

Morris Jay Chalick, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

John Loomis Chamberlain III, *Associate Clinical Professor of Child Health and Development*
B.S. 1953, Amherst College; M.D. 1957, University of Virginia

Patricia Susan Chamberlain, *Adjunct Instructor in Health Care Sciences*
B.S. 1979, George Washington University

Roma Sakhuja Chandra, *Professor of Pathology and of Child Health and Development*
M.B., B.S. 1958, Lady Hardinge Medical College, India

Margan Jamieson Chang, *Associate Professor of Child Health and Development*
B.A. 1967, Johns Hopkins University; M.D. 1971, University of Maryland

Paul P. L. Chang, *Associate Clinical Professor of Medicine*
M.D. 1959, National Taiwan University; M.P.H. 1976, Johns Hopkins University

Robert Merritt Chanock, *Professor of Child Health and Development*
B.S. 1945, M.D. 1947, University of Chicago

Girard A. Chapnick, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1960, Columbia University; M.D. 1964, Vanderbilt University

David L. Charney, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, City University of New York, Brooklyn College; M.D. 1968, State University of New York Upstate Medical Center

Kenneth Herbert Chase, *Assistant Clinical Professor of Medicine*
A.B. 1964, M.D. 1968, University of California, Los Angeles

C. Terrence Chastek, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1973, State University of New York Upstate Medical Center

John Charles Chatel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1961, George Washington University; M.D. 1965, Creighton University

Irene Minna Chatoor-Koch, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1965, Heidelberg University, West Germany

Richard Martin Chavis, *Adjunct Assistant Professor of Ophthalmology*
B.A. 1965, M.S. 1967, Rutgers—The State University; M.D. 1971, University of Missouri

David C. P. Chen, *Assistant Clinical Professor of Radiology (Nuclear Medicine)*
M.D. 1974, National Taiwan University; M.P.H. 1977, M.S. 1981, Johns Hopkins University

Tsung O. Cheng, *Professor of Medicine*
B.S. 1947, M.D. 1950, St. John's University, China; M.S. 1956, University of Pennsylvania

Viola Wai Chiu Cheng, *Assistant Professor of Child Health and Development*
M.D. 1961, National Taiwan University

Judith Mendlowitz Chertoff, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, Brown University; M.D. 1976, City University of New York, Mount Sinai School of Medicine

Kathleen Francis Cheyney, *Clinical Instructor in Surgery*
A.B. 1970, Ohio Wesleyan University; M.D. 1974, Thomas Jefferson University

Om P. Chhabra, *Assistant Clinical Professor of Child Health and Development*
M.B., B.S. 1962, Punjab University, India

Cecilin Lovina Coy Chisholm, *Assistant Clinical Professor of Child Health and Development*
B.S. 1963, M.D. 1967, Howard University

Wu Shung Chiu, *Associate Professor of Medicine*
M.D. 1959, National Taiwan University

Diane Camille Choate, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, M.S.W. 1970, University of Oklahoma

Paul Chodoff, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1934, University of Pennsylvania; M.D. 1938, Thomas Jefferson University

Byung-Il Choi, *Assistant Clinical Professor of Medicine*
M.D. 1965, Severance Medical College, South Korea

Domingo T. Chua, *Clinical Instructor in Health Care Sciences*
M.D. 1962, University of Santo Tomas, Philippines

Francis Chucker, *Assistant Clinical Professor of Medicine*
M.D. 1957, Marquette University

Lloyd Eugene Church, *Associate Professorial Lecturer in Surgery (Oral Surgery)*
A.B. 1942, West Virginia University; D.D.S. 1944, University of Maryland; M.S. 1951, Ph.D. 1959, George Washington University

Judith Ann Fingert Chused, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Wellesley College; M.D. 1967, Harvard University

Michael Louis Cianci, *Adjunct Assistant Professor of Radiology*
B.S. 1968, University of Scranton

Christian Virgil Cimmino, *Clinical Professor of Radiology*
A.B. 1937, Harvard University; M.D. 1941, Johns Hopkins University

Dianne Cresswell Cinnamon, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1968, Muskingum College; M.D. 1973, George Washington University

Mark Ira Cinnamon, *Assistant Clinical Professor of Medicine*
A.B. 1968, Ohio State University; M.D. 1972, State University of New York Downstate Medical Center

Richard Francis Cioffi, *Assistant Clinical Professor of Medicine*
A.B. 1962, College of the Holy Cross; M.D. 1966, College of Medicine and Dentistry of New Jersey

Nicholas Bartholomew Cirillo, *Assistant Clinical Professor of Medicine*
B.S. 1961, M.D. 1965, Georgetown University

Charles Michael Citrin, *Associate Clinical Professor of Radiology*
B.A. 1966, Indiana University; M.D. 1970, State University of New York Downstate Medical Center

Deborah Gray Clapp, *Assistant Professor of Health Care Sciences*
B.A. 1974, Gettysburg College; M.D. 1978, Medical College of Virginia of Virginia Commonwealth University

Thomas Harding Clark, *Clinical Instructor in Medicine*
B.S. 1970, M.D. 1974, George Washington University

Ashley Molesworth Classen, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1975, Baylor University; D.O. 1978, North Texas State University

Alan Bentley Claunch, *Assistant Professor of Medicine (Pulmonary Diseases)*
B.A. 1972, Long Island University, C. W. Post Center; M.D. 1977, Louisiana State University

Barbara Campbell Cloherty, *Lecturer in Medical Technology in Pathology*
B.A. 1973, University of Kansas

James McClay Close, *Associate Clinical Professor of Obstetrics and Gynecology*
A.B. 1951, Virginia Military Institute; M.D. 1955, University of Maryland

Charles Seymour Coakley, *Professor of Anesthesiology; Chairman of the Department of Anesthesiology*
M.D. 1937, George Washington University

Gloria Grimes Cochran, *Associate Clinical Professor of Child Health and Development*
B.S. 1945, M.S. 1949, Duke University

Robert Carter Cochran, *Assistant Professor of Surgery*
A.B. 1955, Princeton University; M.D. 1960, Boston University

Heinrich Hubert Coenen, *Visiting Assistant Research Professor of Radiology*
Dr.Rer.Nat. 1979, University of Cologne, West Germany

George Joel Cohen, *Associate Professor of Child Health and Development*
M.D. 1950, George Washington University

Lawrence Franklin Cohen, *Assistant Clinical Professor of Child Health and Development*
A.B. 1968, Dartmouth College; M.D. 1972, Duke University

Leslie Gerald Cohen, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1960, Ohio State University; M.D. 1964, Yeshiva University

Martin Herbert Cohen, *Professor of Medicine*
B.S. 1960, City University of New York, Queens College; M.D. 1964, New York University

Max Harry Cohen, *Assistant Clinical Professor of Surgery*
A.B. 1961, Columbia University; M.D. 1965, Harvard University; Ph.D. 1970, George Washington University

Philip Cohen, *Associate Professor of Medicine*
B.A. 1966, Columbia University; M.D. 1970, Harvard University

Richard Louis Cohen, *Clinical Instructor in Surgery*
B.S. 1951, Emory University; M.D. 1955, New York Medical College

Victor Hugo Cohn, Jr., *Professor of Pharmacology*
B.S. 1952, Lehigh University; A.M. 1954, Harvard University; Ph.D. 1961, George Washington University

Martha Toma Cole, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1967, Vassar College; M.D. 1977, George Washington University

Allan Bertram Coleman, *Clinical Professor of Child Health and Development*
M.D. 1943, George Washington University

Raymond Hugh Coleman, *Assistant Clinical Professor of Child Health and Development*
B.S. 1969, M.D. 1973, Tufts University

Roy Melvin Coleman, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1952, Harvard University; M.D. 1959, University of Rochester

Stanford Joseph Coleman, Jr., *Clinical Instructor in Child Health and Development*
B.S. 1970, Howard University; M.D. 1975, Stanford University

William Francis Colliton, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1948, Georgetown University

Willard Frederick Conger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, M.D. 1974, University of Pennsylvania

James Joseph Conklin, *Assistant Clinical Professor of Radiology*
B.S. 1964, New Jersey Institute of Technology; M.S. 1968, University of Southern California; M.D. 1973, Temple University

Carmen Keith Conners, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development and Research Professor of Neurology*
B.A. 1953, University of Chicago; M.A. 1955, Oxford University, England; Ph.D. 1960, Harvard University

Thomas Martin Connor, *Assistant Clinical Professor of Child Health and Development*
B.S. 1961, St. Francis College; M.D. 1966, University of Bologna, Italy

Nicholas Lely Constantinople, *Clinical Instructor in Urology*
B.A. 1966, Harvard University; M.D. 1970, Georgetown University

Louis Robert Conte, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1961, Johns Hopkins University

Guido Controni, *Assistant Clinical Professor of Pathology*
B.S. 1955, University of Panama, M.S. 1959, Florida State University

Charles Barrie Cook, *Clinical Professor of Pathology*
B.S. 1945, Hampden-Sydney College; M.D. 1948, George Washington University

Thomas Alfred Cook, Jr., *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1949, University of Virginia

Stewart Dallas Cooley, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1957, Ohio State University; M.D. 1961, University of Cincinnati

F. Donald Cooney, *Clinical Professor of Neurological Surgery*
B.S. 1959, King's College, Pennsylvania, M.D. 1963, University of Pittsburgh

Antonio Alvarez Cooper, *Special Lecturer in Pathology*
B.S. 1972, Howard University

Byron Stanley Cooper, *Assistant Clinical Professor of Medicine*
B.A. 1969, Johns Hopkins University; M.D. 1973, Washington University

Wayne Douglas Cooper, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1969, Alfred University; M.D. 1973, George Washington University

William Hurlbert Cooper, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1946, Case Western Reserve University; M.D. 1949, George Washington University

Bruce Allen Copeland, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1969, University of Rochester; Ph.D. 1974, University of Vermont

Reuben Copperman, *Assistant Clinical Professor of Medicine (Rheumatology)*
B.A. 1944, Temple University; M.S. 1948, M.D. 1955, University of Pennsylvania

Paul Joseph Corso, *Associate Clinical Professor of Surgery*
B.A. 1966, M.D. 1969, George Washington University

Erminio Costa, *Professorial Lecturer in Pharmacology*
M.D. 1947, University of Cagliari, Italy

Jose Costa, *Adjunct Associate Professor of Pathology*
M.D. 1967, University of Barcelona, Spain

Ronald Michael Costell, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1962, M.A. 1967, M.D. 1967, Stanford University

Elaine Wolf Cotlove, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, Columbia University; M.D. 1944, New York University

Laurence Ari Cove, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1955, Columbia University; M.D. 1959, State University of New York Downstate Medical Center

Pamela DeGraaf Cowell, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1969, Kalamazoo College; M.D. 1975, Emory University

Patrick Anthony Coyne, *Clinical Instructor in Surgery (Otolaryngology) and in Child Health and Development*
B.A. 1962, Josephinum College; M.D. 1971, Hahnemann Medical College

John Brown Craft, Jr., *Professor of Anesthesiology and of Obstetrics and Gynecology*
A.B. 1959, Johns Hopkins University; M.D. 1963, Georgetown University

Neil Allan Crane, *Assistant Clinical Professor of Medicine*
B.S.E. 1961, Princeton University; M.D. 1965, Washington University

Ruth Jeanne Crane, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1973, Stanford University, M.D. 1977, Harvard University

William Holmes Crosby, *Clinical Professor of Medicine*
A.B. 1936, M.D. 1940, University of Pennsylvania

Jack Crowell, *Assistant Clinical Professor of Medicine*
B.S. 1947, M.D. 1951, George Washington University

Edward Earl Cunningham, *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1952, Washington and Jefferson College, M.S. 1954, Duquesne University; M.D. 1960, George Washington University

James Allen Curtin, *Professor of Medicine*
A.B. 1946, Canisius College, M.D. 1950, State University of New York at Buffalo

David J. Curtis, *Associate Professorial Lecturer in Radiology*
A.B. 1967, Dartmouth College; M.D. 1971, University of Colorado

Frank Sylvester Curto, Jr., *Adjunct Assistant Professor of Health Care Sciences*
B.A. 1967, Kent State University; M.D. 1971, University of Pittsburgh

Gilbert Bernard Cushner, *Assistant Clinical Professor of Medicine*
M.D. 1958, University of Maryland

Leonard Dean Cutler, *Assistant Clinical Professor of Dermatology*
B.A. 1965, M.D. 1969, University of Maryland

Neal Richard Cutler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1971, M.D. 1975, St. Louis University

Leon Cytryn, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1951, University of Marburg, West Germany

Abraham Hillel Dachman, *Assistant Professorial Lecturer in Radiology*
B.A. 1974, M.D. 1977, Yeshiva University

Gordon Walford Daisley, Jr., *Assistant Clinical Professor of Child Health and Development*
B.A. 1946, Dartmouth College; M.D. 1948, George Washington University

Lawrence James D'Angelo, *Associate Professor of Child Health and Development and of Medicine*
A.B. 1969, M.P.H. 1972, Harvard University; M.D. 1973, Duke University

Douglas Lawrence Daniels, *Special Lecturer in Radiology (Nuclear Medicine Technology)*
B.S. 1969, University of Texas at El Paso

Abraham Wolffe Danish, *Associate Clinical Professor of Medicine*
A.B. 1938, M.D. 1941, George Washington University

Stuart Henry Danovitch, *Clinical Professor of Medicine*
B.A. 1957, Harvard University; M.D. 1960, Northwestern University

Frank Wilson Darr, *Assistant Clinical Professor of Pathology*
B.S. 1968, University of Pittsburgh; M.D. 1973, Emory University

Michael William Datch, *Assistant Clinical Professor of Child Health and Development*
B.A. 1962, Washington and Jefferson College; M.D. 1966, George Washington University

Dennis Martin Davidson, *Adjunct Instructor in Health Care Sciences*
B.S. 1975, George Washington University

David Oliver Davis, *Professor of Radiology and of Neurology; Chairman of the Department of Radiology*
B.S. 1954, University of Illinois; M.D. 1958, St. Louis University

Donald Irvin Davis, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Harvard University; M.D. 1968, University of Pennsylvania

Gilla Prizant Davis, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, B.Sc.M. 1973, M.D. 1975, Northwestern University

Kathleen Kingsford Davis, *Assistant Professor of Health Care Sciences and of Medicine*
A.B. 1968, Wellesley College; M.D. 1977, George Washington University

M. Margaret Rantz Davis, *Instructor in Obstetrics and Gynecology*
B.A. 1973, Bryn Mawr College; M.D. 1977, University of Virginia

Miryam Maltinskis Davis, *Assistant Clinical Professor of Neurology and of Child Health and Development*
M.D. 1957, University of Buenos Aires, Argentina

Robert Day, *Assistant Clinical Professor of Ophthalmology*
A.B. 1936, Harvard University; M.D. 1943, Johns Hopkins University

Ruth Elizabeth Dayhoff, *Research Instructor in Pathology*
B.S. 1973, University of Maryland; M.D. 1977, Georgetown University

Robert Neal DeAngelis, *Assistant Clinical Professor of Dermatology*
M.D. 1968, Medical College of Virginia of Virginia Commonwealth University

Craig Alexander DeAtley, *Assistant Professor of Health Care Sciences*
B.S. 1972, Hampden-Sydney College; B.S. 1975, George Washington University

Edward Charles De Fabo, *Adjunct Assistant Professor of Dermatology*
B.S. 1958, King's College, Pennsylvania; M.Ed. 1965, University of Virginia; Ph.D. 1974, George Washington University

Rosalie De Giovanni-Donnelly, *Associate Professorial Lecturer in Microbiology*
B.A. 1947, M.A. 1953, City University of New York, Brooklyn College; Ph.D. 1961, Columbia University

Ronald Stuart Deitch, *Clinical Instructor in Ophthalmology*
A.B. 1954, Washington and Lee University; M.D. 1958, George Washington University

Leonard L. Deitz, *Clinical Instructor in Surgery*
B.A. 1946, University of North Carolina; M.D. 1950, University of Maryland

John Allen De Krey, *Adjunct Professor of Anesthesiology*
B.S. 1949, Jamestown College; B.S. in Med. 1956, University of North Dakota; M.D. 1958, University of Texas

Donald William Delaney, *Professor of Child Health and Development*
B.S. 1949, St. Michael's College; M.D. 1954, Georgetown University

Morgan Dennis Delaney, *Assistant Professor of Medicine*
B.A. 1967, M.D. 1971, University of Virginia

Armando Antonio DeMoya, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1960, Wake Forest University

Susan Ann DeMuth, *Assistant Clinical Professor of Child Health and Development*
B.A. 1970, Stanford University; M.D. 1973, University of Pennsylvania

W. Donner Denckla, *Adjunct Professor of Medicine*
B.A. 1956, M.D. 1965, Harvard University

Michael William Dennis, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, Brown University; M.D. 1969, Yale University

Raylene Ann De Vine-Curcio, *Clinical Instructor in Child Health and Development*
M.D. 1968, Howard University

Vincent Theodore De Vita, *Professor of Medicine*
B.S. 1957, College of William and Mary; M.D. 1961, George Washington University; D.Sc. 1982, College of William and Mary

Donald Wilson Dew, *Associate Research Professor of Medicine*
B.S. 1964, University of Baltimore; M.S. 1970, Virginia Commonwealth University, Ed.D. 1976, American University

James Alan Deye, *Adjunct Associate Professor of Radiology (Radiation Physics)*
B.A. 1965, Thomas More College; M.S. 1969, Ph.D. 1970, Vanderbilt University

Cipriano Delima Diaz, *Adjunct Instructor in Health Care Sciences*

Giovanni DiChiro, *Clinical Professor of Neurological Surgery*
M.D. 1949, University of Naples, Italy

Kenneth James Dickie, *Associate Professor of Medicine*
M.D. 1963, University of Toronto, Canada

Larry Gilroy Dickson, *Clinical Professor of Pathology*
B.A. 1956, M.D. 1959, Wayne State University

Richard Adolph Di Gioia, *Assistant Clinical Professor of Medicine*
A.B. 1966, Columbia University; M.D. 1970, Washington University

Joseph Amedeo Di Paolo, *Associate Professorial Lecturer in Anatomy*
A.B. 1948, Wesleyan University; M.S. 1949, Case Western Reserve University; Ph.D. 1951, Northwestern University

Carolyn Rose Disparti, *Adjunct Instructor in Health Care Sciences*

Sebastian James Dispenza, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1974, University of Virginia

Andrew Ivo Dobranski, *Assistant Clinical Professor of Orthopaedic Surgery (Anatomy)*
M.D. 1954, Medical Academy of Warsaw, Poland

Oscar Irving Dodek, Jr., *Clinical Professor of Obstetrics and Gynecology and of Biochemistry*
A.B. 1956, University of Michigan; M.D. 1956, George Washington University

David Bernard Doman, *Assistant Clinical Professor of Medicine*
B.A. 1973, New York University; M.D. 1976, Eastern Virginia Medical School

Molla Sloane Donaldson, *Assistant Research Professor of Health Care Sciences*
B.A. 1966, Wellesley College; M.S. 1970, University of Virginia

Orville Wright Donnelly, *Associate Clinical Professor of Medicine*
B.A. 1943, Swarthmore College; M.S. 1951, M.D. 1957, George Washington University

Julia Theresa Donovan, *Adjunct Assistant Professor of Health Care Sciences*
B.A. 1970, University of Massachusetts; M.D. 1974, Georgetown University

John Leo Doppman, *Clinical Professor of Radiology*
B.A. 1949, College of the Holy Cross; M.D. 1953, Yale University

Paul Austin Dorn, Jr., *Clinical Instructor in Ophthalmology*
A.B. 1953, St. Anselm's College; M.D. 1965, Georgetown University

Stefan Dosa, *Assistant Professor of Medicine (Renal Diseases)*
M.D. 1967, J.E. Purkyne University, Czechoslovakia; M.R.C.P. 1974, Royal College of Physicians, London

Ira Dosovitz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, M.D. 1974, University of Pennsylvania

Beverly Goode Douglas, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S., M.S., 1968, Purdue University; M.D. 1975, University of Louisville

Robert LeRoy Dow, *Associate Clinical Professor of Orthopaedic Surgery*
A.B. 1944, M.D. 1948, Cornell University

John Alan Dowling, *Special Lecturer in Surgery*
A.B. 1955, M.D. 1959, Harvard University

Spyros A. Doxiadis, *Visiting Professor of Child Health and Development*
M.B. 1940, M.D. 1943, University of Athens, Greece

Brian Bowles Doyle, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, Harvard University; M.D., C.M. 1966, McGill University

Mary Joy Drass, *Assistant Professor of Medicine*
B.S. 1969, Duquesne University; M.D. 1973, Georgetown University

Edward Martin Druy, *Professor of Radiology*
B.A. 1964, Brown University; M.D. 1968, Yale University

Virginia A. Duggins, *Assistant Clinical Professor of Neurology*
B.A. 1942, Sweet Briar College, M.A. 1951, M.D. 1955, George Washington University

Martin Walter Dukes, Jr., *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1968, Wilberforce University, M.B.A. 1973, Michigan State University, M.D. 1977, University of Nebraska

Burdett Sheridan Dunbar, *Professor of Anesthesiology and of Child Health and Development*
B.S. 1960, M.D. 1963, University of Illinois

Cynthia Dunbar, *Adjunct Instructor in Health Care Sciences*
B.S. 1979, George Washington University

Rosalie Ann Dunn, *Associate Research Professor of Clinical Engineering*
A.B. 1962, M.A. 1965, Ph.D. 1967, Catholic University of America

Lynn Staton Dworsky, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, Austin College; M.D. 1974, University of Texas at San Antonio

Thomas Patrick Dwyer, *Assistant Clinical Professor of Medicine*
B.S. 1954, Boston College; M.D. 1958, Tufts University

Robert Francis Dyer, *Assistant Clinical Professor of Medicine*
B.A. 1951, University of Michigan, M.D. 1955, George Washington University

Noel Kennedy Dysart, Jr., *Assistant Clinical Professor of Health Care Sciences*
B.A. 1967, M.D. 1970, University of Minnesota

Anne Elizabeth Eager, *Clinical Instructor in Ophthalmology*
M.D. 1967, Georgetown University

L. J. Eanet, *Associate Clinical Professor of Dermatology*
A.B. 1952, Harvard University; M.D. 1956, George Washington University

Calvin Buddy Early, *Associate Professor of Neurological Surgery*
B.S. 1952, U.S. Coast Guard Academy; B.A. 1957, M.D. 1960, Ph.D. 1967, Ohio State University

William Charles Eckelman, *Professor of Radiology*
B.S. 1963, St. Louis University; M.A. 1966, Ph.D. 1968, Washington University

Henry Dunlop Ecker, *Clinical Professor of Medicine*
B.S. 1936, M.D. 1940, University of Virginia

Basil Elias Economopoulos, *Assistant Clinical Professor of Anesthesiology*
M.D. 1962, National University of Athens, Greece

George Themistocles Economos, *Assistant Clinical Professor of Medicine*
M.D. 1949, University of Athens, Greece; M.D. 1954, University of Vermont

Richard Nathan Edelson, *Associate Clinical Professor of Neurology*
B.A. 1963, Dartmouth College; M.D. 1966, Harvard University

Sol S. Edelstein, *Associate Professor of Health Care Sciences and of Anesthesiology*
B.S. 1968, M.D. 1972, Wayne State University

Deborah Susan Edge, *Assistant Clinical Professor of Medicine*
B.S. 1970, Tufts University; M.D. 1974, Northwestern University

Craig Edmonds, *Clinical Instructor in Ophthalmology*
A.B. 1964, Harvard University; M.D. 1969, Columbia University

Mitchell Edson, *Associate Clinical Professor of Urology*
B.S. 1949, U.S. Merchant Marine Academy; M.A. 1952, Columbia University; M.D. 1956, Yale University

Maureen Crittenden Edwards, *Associate Professor of Child Health and Development and of Obstetrics and Gynecology*
B.S. 1966, Marquette University; M.D. 1970, George Washington University

James Harold Egan, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1960, College of William and Mary; M.D. 1964, Columbia University

Bernard Ehrlich, *Clinical Instructor in Ophthalmology*
B.S. 1952, M.B., B.Surg. 1956, Durham University, England

Wilfred Russell Ehrmantraut, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.S. 1948, University of Maryland; M.D. 1952, George Washington University

Martin Raymond Eichelberger, *Assistant Professor of Surgery and of Child Health and Development*
A.B. 1967, Princeton University; M.D. 1971, Hahnemann Medical College

Daniel Ein, *Associate Clinical Professor of Medicine*
A.B. 1959, Columbia University; M.D. 1964, Yeshiva University

Arnold H. Einhorn, *Professor of Child Health and Development*
B.A. 1942, University of Montpellier, France; M.D. 1954, University of Paris, France

Rona Copen Eisner, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Smith College; Ph.D. 1967, New York University

Mervyn L. Elgart, *Professor of Dermatology, of Child Health and Development, and of Medicine; Chairman of the Department of Dermatology*
A.B. 1953, City University of New York, Brooklyn College; M.D. 1957, Cornell University

Rodney Lane Ellis, *Clinical Instructor in Medicine*
B.S. 1970, Howard University; M.D. 1975, Stanford University

Leslie C. Ellwood, *Associate Clinical Professor of Health Care Sciences*
B.S. 1963, M.S. 1964, M.D. 1968, University of Florida

Leland Edward Embrey IV, *Special Lecturer in Radiology (Nuclear Medicine)*

Helene Audrey Emsellem, *Assistant Professor of Neurology*
M.D. 1977, George Washington University

March Enders, *Associate Clinical Professor of Medicine*
B.A. 1951, Oberlin College; M.D. 1960, Yale University

Gloria Donna Eng, *Professor of Child Health and Development and of Medicine*
M.D. 1955, Marquette University

John S. Eng, *Special Lecturer in Surgery*
B.S. 1964, Iona College; M.D. 1968, Georgetown University

Milton Engel, *Associate Professorial Lecturer in Psychiatry and Behavioral Sciences and in Child Health and Development*
B.A. 1956, Harvard University, M.D. 1960, Yeshiva University

David Ream Engelman, *Adjunct Associate Professor of Anesthesiology and of Health Care Sciences*
B.S. 1965, University of Florida; M.D. 1969, Emory University

William Francis Enos, *Associate Clinical Professor of Pathology*
A.B. 1942, Dartmouth College; M.D. 1945, State University of New York Downstate Medical Center

Burton Seymour Epstein, *Professor of Anesthesiology and of Child Health and Development*
B.A. 1954, M.D. 1957, George Washington University

Stephen Epstein, *Associate Clinical Professor of Surgery (Otolaryngology)*
B.A. 1960, New York University, M.D. 1964, University of Health Sciences/Chicago Medical School

James Bernard Erdmann, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Pontifical College of Josephinum, M.A. 1964, Ph.D. 1966, Loyola University of Chicago

Mary Frances Ericksen, *Associate Professorial Lecturer in Anatomy*
B.A. 1947, Indiana University, M.A. 1957, Columbia University, Ph.D. 1973, George Washington University

Richard Vernon Erkenbeck, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1952, University of Maryland, M.D. 1956, George Washington University

Delbert Eugene Evans, *Associate Professor of Neurological Surgery*
B.A. 1963, Columbia Union College, M.S. 1966, American University, Ph.D. 1973, Georgetown University

James Lawrence Evans, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Middlebury College; M.D. 1961, Thomas Jefferson University

Mark I. Evans, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1973, Tufts University, M.D. 1978, State University of New York Downstate Medical Center

Richard Evans III, *Associate Clinical Professor of Child Health and Development and of Medicine*
B.A. 1957, Colorado College, M.D. 1961, University of Colorado

Christian Mbamalu Ezekwueche, *Clinical Instructor in Obstetrics and Gynecology*
M.B., B.S. 1971, University of Ibadan, Nigeria

David Nathaniel Fox Fairbanks, *Clinical Professor of Surgery (Otolaryngology)*
B.S. 1960, M.D. 1963, University of Utah

Nancy Ellen Smolen Falk, *Assistant Clinical Professor of Medicine*
B.A. 1967, University of Massachusetts; M.D. 1971, State University of New York Downstate Medical Center

Joseph Leon Falkson, *Associate Professorial Lecturer in Health Care Sciences*
B.A. 1964, Brandeis University; M.A. 1965, Ph.D. 1971, University of Michigan

William Harry Farland, *Adjunct Assistant Professor of Radiology*
B.S. 1970, Loyola University, Los Angeles; M.A. 1972, Ph.D. 1976, University of California, Los Angeles

Richard Lee Fassett, *Assistant Clinical Professor of Health Care Sciences*
B.S., M.D. 1961, Ohio State University

Robert Wayne Fay, *Special Lecturer in Radiology*

Thomas Charles Fearon, *Assistant Professor of Radiology and of Child Health and Development*
A.B. 1969, Catholic University of America; Ph.D. 1975, University of Rochester

Henry Leon Feffer, *Professor of Orthopaedic Surgery*
B.A. 1963, Indiana University at Bloomington; M.D. 1942, Indiana University at Indianapolis

Carl Bruce Feinstein, *Associate Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1963, University of Chicago; M.D. 1968, State University of New York Downstate Medical Center

Morris Feitel, *Clinical Professor of Child Health and Development*
M.D. 1957, George Washington University

Bruce Allen Feldman, *Associate Clinical Professor of Surgery (Otolaryngology)*
A.B. 1962, B.M.S. 1963, Dartmouth College; M.D. 1965, Harvard University

Douglas Edward Feldman, *Assistant Clinical Professor of Surgery (Otolaryngology)*
A.B. 1970, B.M.S. 1971, Dartmouth College; M.D. 1973, Harvard University

Melvin Louis Feldman, *Assistant Clinical Professor of Child Health and Development*
B.S. 1960, George Washington University; M.D. 1964, University of Vermont

Robert Allan Felter, *Assistant Professor of Child Health and Development*
B.S. 1969, M.D. 1973, Georgetown University

William Robert Felts, Jr., *Professor of Medicine*
B.S. 1944, M.D. 1946, University of Arkansas

Leslie Howard Fenton, *Assistant Clinical Professor of Medicine*
M.D. 1959, University of London, England

Nancy Stein Ferebee, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1969, Carnegie-Mellon University; Ph.D. 1975, Duke University

William H. Ferguson, *Clinical Instructor in Surgery*
M.D. 1935, University of Tennessee

Edward Joseph Feroli, *Special Lecturer in Child Health and Development*
B.S. 1955, Massachusetts College of Pharmacy; B.S. 1956, Tufts University; M.D. 1960, George Washington University

Paul Brent Ferrell, *Assistant Professor of Medicine*
B.S. 1971, North Carolina State University at Raleigh; M.D. 1975, University of North Carolina

Richard Alan Ferreras, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1971, Union College, New York; M.D. 1975, State University of New York at Buffalo

Louis Earl Fettig, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Pennsylvania State University; M.D. 1947, Hahnemann Medical College

Thomas Ray Fewell, *Adjunct Instructor in Radiology*
B.S. 1958, Berry College; M.S. 1961, Emory University

Annette Heiser Ficker, *Assistant Professor of Child Health and Development*
A.B. 1965, Trinity College, District of Columbia, M.D. 1969, St. Louis University

Stuart Michael Fidler, *Assistant Clinical Professor of Medicine*
B.A. 1963, Cornell University, M.D. 1967, State University of New York Upstate Medical Center

Alan I. Fields, *Associate Professor of Anesthesiology and of Child Health and Development*
M.D. 1970, State University of New York Downstate Medical Center

Nicolae Filipescu, *Professor of Chemistry and Special Lecturer in Obstetrics and Gynecology*
Ph.D. 1957, University of Industrial Chemistry, Polytechnic Institute, Rumania; Ph.D. 1964, M.D. 1975, George Washington University

Charles Arthur Finder, *Assistant Professor of Radiology*
B.S. 1972, State University of New York at Stony Brook, M.D. 1975, Loyola University of Chicago

Ben Sion Fine, *Associate Research Professor of Ophthalmology*
M.D. 1953, University of Toronto, Canada

Robert Joseph Fink, *Assistant Professor of Child Health and Development*
B.S. 1970, University of Michigan; M.D. 1974, Case Western Reserve University

James David Finkelstein, *Professor of Medicine*
A.B. 1954, Harvard University; M.D. 1958, Columbia University

Max J. Fischer, *Associate Clinical Professor of Surgery (Otolaryngology) and of Child Health and Development*
M.D. 1946, Georgetown University

Robert Andrew Fischer, *Associate Clinical Professor of Medicine*
B.A. 1954, Columbia University, M.D. 1958, Cornell University

Donald Jay Fishman, *Associate Clinical Professor of Neurology and of Child Health and Development*
B.S. 1956, M.D. 1959, University of Illinois

Peter Harvey Fishman, *Professorial Lecturer in Biochemistry*
B.S. 1961, Massachusetts Institute of Technology, M.S. 1967, Ph.D. 1970, George Washington University

Gary M. Fiskum, *Assistant Professor of Biochemistry*
B.A. 1973, University of California, Los Angeles, Ph.D. 1977, St. Louis University

Alf Lee Fjordbotten, *Assistant Clinical Professor of Ophthalmology*
M.D. 1944, University of Alberta, Canada

Richard Leroy Flax, *Assistant Clinical Professor of Surgery*
B.S. 1962, M.D. 1966, University of Maryland

David Elliot Fleischer, *Associate Professor of Medicine*
B.S. 1966, Washington and Lee University, M.D. 1970, Vanderbilt University

Anne Bosshard Fletcher, *Associate Professor of Child Health and Development*
B.A. 1960, Clark University; M.D. 1964, Washington University

John Raymond Fletcher, *Assistant Professor of Surgery*
B.S. 1962, Southern Methodist University, M.D. 1964, Washington University

Mary Ann Fletcher, *Associate Professor of Child Health and Development and of Obstetrics and Gynecology*
B.S. 1965, University of Puget Sound, M.D. 1969, Washington University

Eleanor Coloma Flores, *Assistant Professor of Medicine*
M.D. 1962, University of Santo Tomas, Philippines

Julius Fogel, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1937, University of Virginia

Diane Carmen Fones, *Assistant Professor of Anesthesiology*
B.S. 1973, University of Maryland, M.D. 1977, Wake Forest University

Marvin Peace Footer, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1938, M.D. 1942, George Washington University

Janice Elena Forey, *Lecturer in Pathology*
B.A. 1970, San Jose State University

Judith Ann Hood Forgotson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1958, Washington University; M.D. 1961, University of Rochester

Ulla M-Son Fortune, *Associate Clinical Professor of Orthopaedic Surgery*
M.D. 1965, George Washington University

William Patrick Fortune, *Professor of Orthopaedic Surgery and of Medicine*
B.S. 1953, Springfield College; M.D., George Washington University

Byron Early Fossieck, Jr., *Associate Professor of Medicine*
B.A. 1961, Drury College; M.D. 1965, Northwestern University

William Joseph Fouty, *Clinical Professor of Surgery*
B.S. 1952, M.D. 1957, Ohio State University

Karyle Zeffie Fowler, *Clinical Instructor in Child Health and Development*
B.S. 1964, M.D. 1968, Howard University

Mary Ruth Johns Fox, *Assistant Clinical Professor of Child Health and Development*
M.D. 1967, State University of New York Upstate Medical Center

William Charles Fox, *Special Lecturer in Pathology*

Daniel Francis Fragnul, *Assistant Professor of Medicine*
M.D. 1950, University of Padua, Italy

David Hirsch Fram, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1959, Cornell University; M.D. 1963, Yale University

Jack David Francis, *Clinical Instructor in Urology*
A.B. 1965, M.D. 1968, George Washington University

Richard Peter Franco, *Special Lecturer in Radiology*

Arthur Frank, *Assistant Clinical Professor of Medicine*
B.S. 1956, Massachusetts Institute of Technology; M.S. 1958, University of Pennsylvania; M.D. 1962, New York University

Colin H. Frank, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1966, Columbia University; M.S. 1969, Ph.D. 1971, University of Oklahoma

Justin Arthur Frank, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, University of California, Berkeley; M.D. 1968, University of Louisville

Martin Frank, *Associate Professorial Lecturer in Physiology*
A.B. 1969, M.S. 1971, Ph.D. 1973, University of Illinois

Randolph Adams Frank, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1946, M.D. 1948, Vanderbilt University

Bennett Frank Frankel, *Assistant Clinical Professor of Surgery (Oral Surgery)*
D.M.D. 1967, University of Pennsylvania

Bernard Leonard Frankel, *Associate Professor of Psychiatry and Behavioral Sciences and of Medicine*
B.S. 1963, City University of New York, City College; M.D. 1967, Yeshiva University

Robert Saul Frankel, *Assistant Clinical Professor of Radiology*
B.A. 1966, Washington and Jefferson College; M.D. 1970, Case Western Reserve University

Donald Sharp Frederickson, *Professorial Lecturer in Medicine*
B.S. 1946, M.D. 1949, University of Michigan

Andrew A. Freier, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1947, University of London, England; M.R.C.O.G. 1957, Royal College of Obstetricians and Gynecologists, England; F.R.C.S. 1960, Royal College of Surgeons, Canada

Frederick John Frensilli, *Clinical Professor of Urology*
A.B. 1957, College of the Holy Cross; M.D. 1961, Georgetown University

Thomas Frey, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.A. 1955, M.D. 1958, Northwestern University

William Andrew Fried, *Assistant Clinical Professor of Child Health and Development*
B.A. 1972, State University of New York at Buffalo; M.D. 1976, University of Pennsylvania

Adolph A. Friedman, *Assistant Clinical Professor of Medicine*
B.A. 1939, University of Pennsylvania; M.D. 1943, Thomas Jefferson University

Alan Jerry Friedman, *Assistant Clinical Professor of Neurology*
A.B. 1970, University of Pennsylvania; M.D. 1974, Cornell University

Arnold C. Friedman, *Assistant Professorial Lecturer in Radiology*
B.A. 1972, Cornell University; M.D. 1975, Yeshiva University

Arnold Jay Friedman, *Assistant Professor of Obstetrics and Gynecology*
B.A. 1969, City University of New York, Queens College; M.D. 1973, New York University

Herbert N. Friedman, *Assistant Professor of Medicine*
B.A. 1971, University of Maryland, Baltimore County; M.D. 1975, University of Maryland at Baltimore

Leonard Malcolm Friedman, *Clinical Instructor in Ophthalmology*
B.A. 1965, University of Pennsylvania; M.D. 1969, George Washington University

David Stern Friendly, *Professor of Ophthalmology and of Child Health and Development*
B.A. 1954, Carleton College; M.D. 1958, Columbia University

Agnes Gordon Sampson Fry, *Assistant Research Professor of Medicine*
B.S. 1943, Madison College

Glenn H. Fuchs, *Clinical Instructor in Dermatology*
B.A. 1973, M.D. 1977, New York University

Marvin Fuchs, *Clinical Professor of Medicine*
B.S. 1941, City University of New York, City College; M.D. 1944, New York University

June Eloise Fusner, *Assistant Professor of Child Health and Development*
A.B. 1969, M.D. 1973, University of Rochester

Kenneth Ray Gaarder, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1954, University of Minnesota

Grace Priscilla Gabe, *Assistant Clinical Professor of Neurology and of Psychiatry and Behavioral Sciences*
B.A. 1955, Radcliffe College; M.D. 1959, Boston University

Richard Leo Gaertner, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1961, Pennsylvania State University; M.D. 1965, Temple University

Edward Elias Gahres, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1950, Rutgers—The State University; M.S. 1951, George Washington University; M.D. 1958, University of Virginia

Dorothy Berlin Gail, *Assistant Research Professor of Medicine*
B.A. 1966, City University of New York, Hunter College; M.A. 1968, Boston University; Ph.D. 1973, Georgetown University

Allen Gaisin, *Assistant Clinical Professor of Dermatology and of Child Health and Development*
B.A. 1968, Temple University; M.D. 1972, Hahnemann Medical College

Juarlyn Lucille Gaiter, *Assistant Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1969, Eckerd College; M.A. 1971, Ph.D. 1973, Brown University

Frank Martin Galioto, *Associate Professor of Child Health and Development*
A.B. 1964, Cornell University; M.D. 1968, New York Medical College

Philip Joseph Galipeau, *Clinical Instructor in Surgery (Oral Surgery)*
B.S. 1968, Stone Hill College; D.D.S. 1971, Georgetown University

Linda Lou Gallo, *Associate Professor of Biochemistry*
B.S. 1959, West Virginia University; M.S. 1963, Ph.D. 1969, George Washington University

Janet Lee Garber, *Adjunct Instructor in Health Care Sciences*
B.S. 1978, George Washington University

Jorge Mance Garcia, *Associate Clinical Professor of Surgery*
M.D. 1964, University of Santo Tomas, Philippines

David John Gardner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Atlantic Union College; M.D. 1961, Loma Linda University

Melinda Miller Gardner, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1965, Duke University; M.D. 1974, George Washington University

Sheryl Paige Gardner, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1967, M.D. 1971, University of Oregon

Bruce Neil Garrett, *Assistant Professor of Medicine*
B.S. 1969, Dickinson College; M.D. 1973, Medical College of Pennsylvania

Carleton Theodore Garrett, *Associate Professor of Pathology*
A.B. 1962, Lehigh University; M.D. 1966, Johns Hopkins University; Ph.D. 1977, University of Wisconsin

Margaret Lucretia Garrett, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1952, Bucknell University; M.D. 1956, University of Pennsylvania

Jerry William Gaskill, *Associate Research Professor of Radiology*
B.A. 1963, Oberlin College; M.A. 1967, M.Phil. 1970, M.S.A. 1975, George Washington University

Joe Harvey Gaskin, *Associate Professor of Medicine*
B.S. 1956, Davidson College; M.D. 1960, University of Pennsylvania

Maurice Leonard Gaspar, *Clinical Instructor in Ophthalmology*
B.A. 1974, City University of New York, Brooklyn College; M.D. 1977, Yeshiva University

Paul Theodore Gavaris, *Assistant Clinical Professor of Ophthalmology*
B.S. 1961, Rutgers—The State University; M.D. 1968, George Washington University

Glenn William Geelhoed, *Associate Professor of Surgery*
A.B. 1964, B.S. 1965, Calvin College; M.D. 1968, University of Michigan

Leon Paul Georges, *Assistant Professor of Medicine*
B.A. 1958, New York University; B.M.S. 1960, M.D. 1963, University of Geneva, Switzerland

Naomi Lynn Hurwitz Gerber, *Adjunct Associate Professor of Medicine (Rehabilitation Medicine)*
B.A. 1965, Smith College; M.D. 1971, Tufts University

Richard Borisow Gerber, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1965, Amherst College; M.D. 1969, Harvard University

Stanley George Gerding, *Special Lecturer in Pathology*

Barton Jerome Gershen, *Associate Clinical Professor of Medicine*
B.S. 1954, M.D. 1957, University of Vermont

Norah Janet Getgood, *Adjunct Instructor in Health Care Sciences*
B.A. 1972, College of Wooster

Nasser Ghaed, *Assistant Clinical Professor of Radiology*
M.D. 1963, Shiraz Medical School, Iran

Kamal Ghaemi, *Clinical Instructor in Neurological Surgery*
M.D. 1955, University of Tehran, Iran

Junette Carlson Gibbons, *Assistant Clinical Professor of Medicine*
B.S.M. 1972, M.D. 1974, University of Nebraska

Raymond Edward Gibson, *Associate Research Professor of Radiology*
B.A. 1969, University of California, Santa Cruz; Ph.D. 1972, University of California, Santa Barbara

Charles Richard Alsop Gilbert, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1944, University of Virginia

William Steven Gilbert, *Associate Clinical Professor of Ophthalmology*
A.B. 1957, Cornell University; M.D. 1961, Yeshiva University

Robert James Gillanders, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1960, College of the Holy Cross, M.D. 1964, Georgetown University

John Christian Gillin, *Professorial Lecturer in Physiology*
B.A. 1961, Harvard University; M.D. 1966, Case Western Reserve University

Robert David Gillman, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1939, Mus.B. 1940, Yale University; M.A. 1945, Columbia University; M.D. 1950, George Washington University

Janet Ann Gingold, *Clinical Instructor in Child Health and Development*
B.A. 1972, M.D. 1977, University of Michigan

Allen Louis Ginsberg, *Associate Professor of Medicine*
B.A. 1962, Princeton University; M.D. 1966, Johns Hopkins University

Joseph Martin Giordano, *Associate Professor of Surgery*
B.A. 1963, Georgetown University; M.D. 1967, Thomas Jefferson University

Jeffrey Michael Gitelman, *Assistant Clinical Professor of Surgery (Oral Surgery)*
D.D.S. 1971, Howard University

Allen Martin Glasgow, *Associate Professor of Child Health and Development*
B.S. 1963, Hampden-Sydney College; M.D. 1967, University of Virginia

David Roger Glass, Jr., *Assistant Research Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, University of Michigan; M.A. 1974, Ph.D. 1978, University of California, Los Angeles

Leonard Mark Glassman, *Associate Clinical Professor of Radiology*
B.S. 1967, Pennsylvania State University; M.D. 1969, Thomas Jefferson University

Milton Sanford Glatt, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1946, Johns Hopkins University; M.D. 1951, University of Geneva, Switzerland

William Bainbridge Glew, *Assistant Clinical Professor of Ophthalmology*
B.S. 1950, Yale University; M.D. 1953, George Washington University; M.S. 1957, University of Minnesota

Matthew U. Glover, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1971, University of Florida; M.D. 1975, University of South Florida

William Lloyd Glover, Jr., *Assistant Clinical Professor of Urology*
B.S. 1962, M.D. 1965, University of Tennessee

Rita Sue Kaplan Gluck, *Assistant Clinical Professor of Child Health and Development*
B.S. 1968, New York University; M.D. 1974, George Washington University

Alan E. Gober, *Assistant Clinical Professor of Child Health and Development*
B.A. 1970, Western Maryland College; M.D. 1974, University of Maryland

Ira David Godwin, *Associate Clinical Professor of Pathology*
B.S. 1952, M.D. 1955, University of North Carolina

Michael Anthony Goelz, *Adjunct Instructor in Radiology*

Bess Granot Gold, *Assistant Professor of Child Health and Development*
B.A. 1969, Cornell University; M.D. 1976, George Washington University

Harvey Robert Gold, *Associate Clinical Professor of Child Health and Development*
A.B. 1956, Lafayette College; M.D. 1960, State University of New York Upstate Medical Center

Michael Stephen Gold, *Associate Professor of Medicine*
A.B. 1959, Harvard University; M.D. 1963, State University of New York Downstate Medical Center

Deborah Baron Goldberg, *Assistant Clinical Professor of Medicine*
A.B. 1964, M.D. 1968, Harvard University

Herbert Abraham Goldberg, *Associate Clinical Professor of Urology*
M.D. 1935, University of St. Andrews, Scotland

Marianne Rudolf Goldberger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1953, Radcliffe College; M.D. 1958, New York University

Allan L. Goldstein, *Professor of Biochemistry; Chairman of the Department of Biochemistry*
B.S. 1959, Wagner College; M.S. 1961, Ph.D. 1964, Rutgers—The State University

Howard Seth Goldstein, *Assistant Clinical Professor of Medicine*
B.A. 1967, Colgate University; M.D. 1971, George Washington University

Kenneth Goldstein, *Associate Clinical Professor of Medicine*
B.A. 1962, Oberlin College; M.D. 1966, Case Western Reserve University

Norman Philip Goldstein, *Professorial Lecturer in Neurology*
B.A. 1941, New York University; M.A. 1942, M.D. 1946, George Washington University

Robert Arnold Goldstein, *Associate Clinical Professor of Medicine (Pulmonary Diseases)*
A.B. 1962, Brandeis University; M.D. 1966, Thomas Jefferson University; Ph.D. 1976, George Washington University

Herbert Otto Goller, *Assistant Research Professor of Orthopaedic Surgery*
B.S. in M.E. 1958, Stevens Institute of Technology; M.S. 1964, Ph.D. 1968, State University of New York at Buffalo

Herbert Stanley Golomb, *Assistant Clinical Professor of Dermatology*
A.B. 1955, University of Pennsylvania; M.D. 1960, State University of New York Downstate Medical Center

Nelida Gonzalez, *Clinical Instructor in Medicine*
A.B. 1967, City University of New York, Hunter College; M.D. 1971, Georgetown University

Walter Yau Kwai Goo, *Assistant Clinical Professor of Medicine*
B.A. 1960, Harvard University; M.D. 1964, Case Western Reserve University

David John Goodenough, *Associate Professor of Radiology (Radiation Physics)*
B.S. 1967, Ph.D. 1972, University of Chicago

David Henry Goodman, *Assistant Clinical Professor of Medicine*
A.B. 1959, University of Pennsylvania; M.D. 1963, George Washington University

Sam Leon Goodman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1963, City University of New York, Brooklyn College; M.D. 1967, Yeshiva University

Gene Gordon, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1942, Harvard University; M.D. 1946, Boston University

Henri Gordon, *Clinical Instructor in Medicine*
A.B. 1958, Brown University, M.D. 1963, New York University, M.P.H. 1969, Columbia University

Spencer Gordon, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Princeton University; M.D. 1956, Harvard University

Kenneth Paul Gorelick, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, Rutgers—The State University; M.D. 1967, Harvard University

Barry Charles Gorman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1967, Tufts University; M.D. 1971, George Washington University

Patrick Alan Gorman, *Associate Professor of Medicine*
M.B. 1954, B.Ch. 1954, B.A.O. 1954, Queens University, Ireland; D.C.H. 1956, University of London, England

Ejnar F. Gottlieb, *Assistant Clinical Professor of Health Care Sciences*
M.D. 1945, Deutsche-Alpen University, Austria

Sheldon Kenneth Gottlieb, *Professorial Lecturer in Dermatology*
B.A. 1961, Case Western Reserve University; M.D. 1966, Howard University

Herbert Bennett Gould, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1967, City University of New York, Brooklyn College; M.D. 1971, New York University

Suresh Chandra Goyal, *Assistant Clinical Professor of Child Health and Development*
B.S. 1956, Dr. in Ped. 1967, University of Lucknow, India; M.B., B.S. 1961, King George's Medical College, India

James Henry Graeter, *Assistant Clinical Professor of Orthopaedic Surgery*
B.S. 1970, M.D. 1974, Georgetown University

William Louis Granatir, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1936, University of Pennsylvania, M.D. 1941, Hahnemann Medical College

Melvin A. Gravitz, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1950, M.A. 1951, George Washington University; Ph.D. 1955, Adelphi University

Luther Wilson Gray, Jr., *Assistant Clinical Professor of Surgery*
A.B. 1961, University of Pennsylvania; M.D. 1966, George Washington University

Frederick Chapman Green, *Professor of Child Health and Development and of Health Care Sciences*
B.S. 1942, Indiana University at Bloomington, M.D. 1944, Indiana University at Indianapolis

Linda D. Green, *Assistant Clinical Professor of Medicine*
B.A. 1966, Rice University; M.D. 1970, Duke University

Jay Barry Greenberg, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, M.D. 1975, George Washington University

Larrie Warren Greenberg, *Associate Professor of Child Health and Development*
B.S. 1961, University of Toledo; M.D. 1965, Ohio State University

Richard Alan Greenberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1968, Albright College; M.D. 1973, Thomas Jefferson University

Robert Milton Greenberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1937, M.D. 1941, George Washington University

Charles Stanley Greenhouse, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1959, Alfred University; M.D. 1963, Howard University

Stanley I. Greenspan, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Harvard University; M.D. 1966, Yale University

Douglas Fielder Greer, *Adjunct Assistant Professor of Ophthalmology*
B.A. 1961, Princeton University; M.D. 1966, Columbia University

Thomas Hamlin Gresinger, *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1957, Williams College; M.D. 1961, George Washington University

Charleen Ann Griemsman, *Adjunct Instructor in Health Care Sciences*

James Franklin Grim, *Assistant Clinical Professor of Neurology*
B.S. 1964, College of William and Mary; M.S. 1968, George Washington University; M.D. 1971, Emory University

Jay M. Grodin, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1961, Hobart and William Smith Colleges; M.D. 1965, Thomas Jefferson University

Albert H. Grollman, *Associate Clinical Professor of Medicine*
B.A. 1952, Lafayette College; M.D. 1956, Thomas Jefferson University

Martha Winter Gross, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1968, University of Wisconsin; M.S.W. 1971, University of Chicago

Peter Leonard Gross, *Assistant Clinical Professor of Urology*
B.S. 1963, Hobart and William Smith Colleges; M.D. 1968, New York University

Richard Lee Gross, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1956, Muhlenberg College; M.D. 1960, Hahnemann Medical College

John Henry Grossman III, *Associate Professor of Obstetrics and Gynecology, of Pathology, and of Microbiology*
A.B. 1967, M.D. 1971, University of Rochester; Ph.D. 1982, George Washington University

Kenneth Martin Grundfast, *Associate Professor of Surgery and of Child Health and Development*
B.A. 1965, Johns Hopkins University; M.D. 1969, State University of New York Upstate Medical Center

Vincent Livingston Guandolo, *Associate Clinical Professor of Child Health and Development*
A.B. 1953, Kenyon College; M.D. 1962, George Washington University

Arthur P. Guarinello, *Assistant Clinical Professor of Health Care Sciences and of Child Health and Development*
M.D. 1973, State University of New York Downstate Medical Center

John Gregory Guccion, *Associate Professor of Pathology*
B.A. 1958, John Carroll University; M.D. 1962, Georgetown University

Atin Guha, *Associate Clinical Professor of Medicine*
M.D. 1962, Calcutta National Medical Institute, India

Diane Antoinette Guida, *Assistant Professor of Health Care Sciences*
B.S.N. 1964, Cornell University; M.S. 1968, University of Rochester

Grace Hughes Guin, *Clinical Professor of Pathology*
B.S. 1938, Birmingham-Southern College; M.D. 1943, Vanderbilt University

Carl Harmon Gunderson, *Adjunct Professor of Neurology*
B.S. 1954, University of Notre Dame; M.S. 1958, M.D. 1958, University of Chicago

Pamela Jo Gunter-Smith, *Assistant Professorial Lecturer in Physiology*
B.S. 1973, Spelman College; Ph.D. 1978, Emory University

Stephen Flack Gunther, *Associate Professor of Orthopaedic Surgery*
B.A. 1963, Yale University; M.D. 1967, Albany Medical College of Union University

Gordon Guroff, *Professorial Lecturer in Biochemistry*
B.S. 1954, University of Illinois; M.S. 1956, Auburn University; Ph.D. 1959, University of Wisconsin

Milton Gusack, *Clinical Professor of Medicine*
B.A. 1937, M.D. 1941, Johns Hopkins University

John William Guthrie, *Special Lecturer in Pathology*

Philip Conte Guzzetta, *Assistant Professor of Surgery and of Child Health and Development*
B.S. 1968, Marquette University; M.D. 1972, Medical College of Wisconsin

Melvyn Robert Haas, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, University of Pennsylvania; M.D. 1964, Georgetown University

Stephen Samuel Haas, *Associate Clinical Professor of Orthopaedic Surgery*
M.D. 1965, University of Oklahoma

Paul Adrian Haber, *Assistant Clinical Professor of Medicine*
B.A. 1941, University of Texas at Austin; M.A. 1942, Columbia University; M.D. 1949, University of Texas Medical Branch at Galveston; M.S. in P.A. 1968, George Washington University

Herbert Richard Hagenau, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1962, Franklin and Marshall College; Ph.D. 1977, Catholic University of America

John Thomas Hagenbucher, *Assistant Clinical Professor of Medicine*
B.S. 1950, Philadelphia College of Pharmacy and Science; M.D. 1957, George Washington University

Edward Joseph Hager, *Assistant Clinical Professor of Surgery (Otolaryngology) and of Child Health and Development*
M.D. 1959, University of Vienna, Austria

Riaz Haider, *Associate Clinical Professor of Medicine*
M.B., B.S. 1956, University of Panjab, Pakistan

Richard Earl Halbert II, *Assistant Professorial Lecturer in Pathology*
B.A. 1972, M.D. 1976, University of Colorado

Debra Lynn Hall, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1973, Brown University; M.D. 1977, University of Virginia

Evelyn Manning Hall, *Clinical Instructor in Child Health and Development*
B.S. 1967, M.D. 1973, Howard University; M.P.H. 1977, Columbia University

James Henderson Hall III, *Adjunct Associate Professor of Health Care Sciences*
M.D. 1966, Emory University

James Lyman Hall, *Assistant Clinical Professor of Pathology*
A.B. 1964, Dartmouth College; M.D. 1968, University of Michigan; Ph.D. 1973, Duke University

Nicholas Robert S. Hall, *Assistant Research Professor of Biochemistry*
B.A. 1971, Ph.D. 1976, University of Florida

William Henry Hall, *Clinical Instructor in Ophthalmology*
B.S. 1971, Howard University; M.D. 1975, State University of New York at Buffalo

Lee Higdon Haller, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1968, M.D. 1972, University of Michigan

David Philip Hamburger, *Assistant Clinical Professor of Child Health and Development*
A.B. 1968, Brandeis University; M.D. 1972, New York University

Melvin Neal Hamm, *Assistant Professorial Lecturer in Health Care Sciences*
B.S. 1967, Southwestern Oklahoma State University; M.S. 1972, University of Oklahoma

Jennifer Florer Hammer, *Adjunct Instructor in Health Care Sciences*
B.S. 1979, George Washington University

Mary Kathryn Hammock, *Assistant Professor of Neurological Surgery and of Child Health and Development*
B.S. 1959, University of Miami; M.D. 1967, Northwestern University

John Wroe Hammond III, *Adjunct Instructor in Health Care Sciences*

Richard Davis Handy, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1967, Harvard University; M.D. 1971, Boston University

Raafat Samy Hannallah, *Associate Professor of Anesthesiology and of Child Health and Development*
M.B., Ch.B. 1966, Cairo University, Egypt

Ernest Dalton Hanowell, *Assistant Clinical Professor of Surgery*
B.S. 1969, University of California, Davis; M.D. 1973, George Washington University

Jane Longo Hanscom, *Clinical Instructor in Surgery*
B.A. 1967, University of Maine; M.D. 1971, George Washington University

Charles Davenport Hanson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, M.D. 1969, Harvard University; J.D. 1973, Georgetown University

Kenneth R. Harbert, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1975, State University of New York at Stony Brook; M.A. 1980, Central Michigan University

George White Hardman, Jr., *Associate Clinical Professor of Child Health and Development*
A.B. 1954, M.D. 1958, Johns Hopkins University

Leonidas A. Harisiadis, *Associate Professor of Radiology*
M.D. 1966, National University, Greece

Judith Ann Harman, *Assistant Clinical Professor of Health Care Sciences*
B.S.N. 1972, University of Oklahoma

Forest Klaire Harris II, *Assistant Clinical Professor of Medicine*
B.S. 1949, M.D. 1953, George Washington University

Isabella Harrison, *Assistant Clinical Professor of Surgery*
A.B. 1934, Vassar College; M.D. 1938, Johns Hopkins University

David Scott Hartman, *Assistant Clinical Professor of Radiology*
B.A. 1968, University of California, Santa Barbara; M.D. 1972, University of California, Los Angeles

Thomas Lees Hartman, *Assistant Clinical Professor of Medicine*
A.B. 1936, Muhlenberg College; A.M. 1938, University of Texas; M.D. 1943, Johns Hopkins University

Jack Wayne Harvey, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1959, M.D. 1963, George Washington University

William Herbert Harvey, *Assistant Clinical Professor of Medicine*
B.S. 1952, Wagner College; M.D. 1956, Albany Medical College of Union University

Susana Alicia Hassan, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1969, Ph.D. 1974, University of California, Berkeley

Donald E. Hawkins, *Professor of Human Kinetics and Leisure Studies and Research Professor of Medicine*
A.B. 1958, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, New York University

Harold Pierce Hawley, Jr., *Assistant Professor of Pathology*
B.S. 1967, Cornell University; M.D. 1971, State University of New York Upstate Medical Center

George Joseph Hayes, *Clinical Professor of Neurological Surgery*
B.S. 1940, Catholic University of America; M.D. 1943, Johns Hopkins University

Murdock Head, *Airlie Professor of Medical and Public Affairs; Chairman of the Department of Medical and Public Affairs*
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; LL.B. 1958, George Washington University

Bernard Alvin Heckman, *Associate Clinical Professor of Medicine*
B.S. 1958, George Washington University; M.D. 1962, University of Virginia

Charles H. Heffron, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1967, U.S. Air Force Academy; M.D. 1971, University of Michigan

Lawrence G. Hefter, *Assistant Clinical Professor of Pathology*
M.D. 1963, University of Chicago

Alan Louis Heine, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1967, M.D. 1971, University of Pennsylvania

Achim Jurgen Heintze, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1967, University of Hamburg, West Germany

Naomi Birnbaum Heller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, B.S. 1956, University of Chicago; M.D. 1960, Harvard University

Louis M. Hellman, *Professorial Lecturer in Obstetrics and Gynecology*
Ph.B. 1930, Yale University; M.D. 1934, Johns Hopkins University

Elson Bowman Helwig, *Clinical Professor of Pathology (Dermatologic Pathology)*
B.S. 1930, M.D. 1932, Indiana University

Robert Lee Hendren, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1971, University of Utah; D.O. 1975, Kirksville College of Osteopathic Medicine

Frederick Barrie Hendricks, *Assistant Clinical Professor of Urology*
A.B. 1958, DePauw University; M.D. 1962, Johns Hopkins University

Maria Mira Herenda, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1955, Bonn University, West Germany

Gilbert Richard Herer, *Professor of Child Health and Development and of Audiology*
B.S. 1953, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

Monte Arnold Herman, *Assistant Clinical Professor of Medicine*
B.A. 1956, M.D. 1959, George Washington University

Stephen Peter Hersh, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Amherst College; M.D. 1967, New York University

Sandra Gail Hershberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1971, New York University; M.D. 1975, Yale University

Melvin Hershkowitz, *Associate Clinical Professor of Medicine*
A.B. 1942, Columbia University; M.D. 1945, New York University

Marc Hertzman, *Associate Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, M.D. 1969, Harvard University

Elisabeth Kremenak Herz, *Associate Clinical Professor of Obstetrics and Gynecology and of Psychiatry and Behavioral Sciences*
M.D. 1951, University of Vienna, Austria

Joseph Herbert Herzberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1965, University of Wisconsin

John Hamilton Hewitt III, *Clinical Instructor in Child Health and Development*
M.D. 1978, Howard University

Jocelyn Muriel B. Hicks, *Professor of Child Health and Development*
B.S. 1959, M.S. 1962, University of London, England, Ph.D. 1971, Georgetown University

Robert Duane Hicks, *Special Lecturer in Radiology*

George A. Higgins, Jr., *Professor of Surgery*
B.S. 1938, University of New Mexico, M.D. 1942, Harvard University

Fred George Hilkert, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, Syracuse University, M.D. 1955, George Washington University

Michael Christopher Hill, *Associate Professor of Radiology*
M.B., B.Ch. 1970, University College, Dublin, Ireland

Edward John Hinman, *Associate Clinical Professor of Health Care Sciences*
M.D. 1955, Tulane University, M.P.H. 1971, Johns Hopkins University

Joseph Herman Hochheiser, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1967, Tufts University; M.D. 1971, Georgetown University

Howard Alan Hoffman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1958, M.D. 1962, Case Western Reserve University

Julius Hoffman, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.A. 1941, M.D. 1944, New York University, M.A. 1958, M.M.Sc. 1962, Ohio State University

Judith Elaine Hogg, *Assistant Clinical Professor of Neurology*
A.B. 1970, M.D. 1970, Boston University

Peter R. Holbrook, *Associate Professor of Anesthesiology and of Child Health and Development*
B.A. 1966, Yale University; M.D. 1970, University of Pennsylvania

Sheldon Holen, *Clinical Instructor in Surgery (Periodontics)*
D.D.S. 1955, University of Maryland; M.P.H. 1962, Columbia University

Paul Vincent Holland, *Associate Clinical Professor of Medicine*
B.A. 1958, University of California, Riverside, M.D. 1962, University of California, Los Angeles

Ariel Cahill Hollinshead, *Research Professor of Medicine (Pharmacology)*
A.B. 1951, D.Sc. 1977, Ohio University, A.M. 1955, Ph.D. 1957, George Washington University

Nancy Marie Hoover, *Adjunct Instructor in Health Care Sciences*
B.S.N. 1973, Georgetown University

Steven Blair Hopping, *Clinical Instructor in Surgery (Otolaryngology)*
B.A. 1971, Brown University; M.D. 1975, University of Cincinnati

Richard Steven Horkman, *Lecturer in Pathology*
B.S. 1970, University of South Carolina

Carole Elizabeth Horn, *Assistant Professor of Medicine*
B.A. 1966, Brandeis University, M.A. 1969, Columbia University, M.D. 1978, George Washington University

Nancy Mary Horstmann, *Assistant Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1971, University of Rochester; M.A. 1974, Ph.D. 1977, University of Maryland

Klara Horvath-Pushkas, *Assistant Clinical Professor of Radiology*
M.D. 1968, University of Budapest, Hungary

Norman Harold Horwitz, *Clinical Professor of Neurological Surgery*
A.B. 1945, Princeton University; M.D. 1948, Columbia University

Stephen Joel Horwitz, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1972, M.D. 1976, George Washington University

Stuart Lawrence Horwitz, *Clinical Instructor in Medicine*
A.B. 1972, Colgate University; M.D. 1978, George Washington University

Susan Hays Houseman, *Assistant Clinical Professor of Medicine*
B.A. 1966, Oberlin College; M.D. 1970, Wayne State University

William Allen Howard, *Clinical Professor of Child Health and Development*
M.D. 1934, Tulane University

James Robert Howe, *Assistant Clinical Professor of Neurological Surgery*
A.B. 1965, Dartmouth College; M.D. 1969, Tufts University

Irene I-Lien Hsu, *Professor of Medicine*
B.S. 1946, St. John's University, China; M.D. 1949, University of Vermont

Kun-huang Huang, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1970, University of Tokyo, Japan

Kun-yen Huang, *Professor of Microbiology*
M.D. 1959, National Taiwan University; Ph.D. 1967, George Washington University

Van Saxton Hubbard, *Assistant Research Professor of Child Health and Development*
B.S. 1967, Union College, New York; Ph.D., M.D. 1974, Medical College of Virginia of Virginia Commonwealth University

Richard Huberman, *Clinical Instructor in Ophthalmology*
B.S. 1959, City University of New York, City College; M.D. 1963, University of Health Sciences/Chicago Medical School

Rudolph Hugh, *Professor of Microbiology*
B.S. 1948, Michigan State University; Ph.D. 1954, Loyola University of Chicago

Violet Bowen Hugh, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1958, M.D. 1961, George Washington University

William Stevenson Hughes, *Associate Clinical Professor of Medicine (Gastroenterology)*
B.A. 1960, Yale University; M.D. 1965, University of Pennsylvania

Wellington Hung, *Professor of Child Health and Development*
B.S. 1953, American University; M.D. 1957, George Washington University

Robert Edward Hunt, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1969, Morningside College; M.D. 1973, University of Iowa

James A. Huntzinger, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. in Ed. 1949, Kutztown State College; M.S. in Ed. 1957, Temple University; M.D. 1961, Howard University

John Kevin Hurley, *Assistant Clinical Professor of Child Health and Development*
A.B. 1965, College of the Holy Cross; M.D. 1969, State University of New York Downstate Medical Center

Arthur Proctor Hustead, *Clinical Professor of Neurological Surgery*
B.S. 1949, M.D. 1952, Yale University

Janet Kauderer Hutcheson, *Associate Clinical Professor of Radiology*
B.A. 1955, Barnard College; M.D. 1959, University of Tennessee

Robert Gordon Huth, *Adjunct Instructor in Health Care Sciences*
B.A. 1972, Middlebury College; B.M.S. 1979, Emory University

William Siti Nagib Ibrahim, *Clinical Instructor in Ophthalmology*
M.B., B.Ch. 1958, Alexandria University, Egypt

James Nels Ihle, *Adjunct Associate Professor of Biochemistry*
B.S. 1968, Iowa State University; M.S. 1969, Ph.D. 1971, University of Georgia

George Dewey Imes, Jr., *Adjunct Assistant Professor of Pathology*
B.S., D.V.M. 1955, University of Missouri; M.S. 1964, Kansas State University

Virginia Grace Ingram, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1951, M.D. 1955, Case Western Reserve University

Sands Kenyon Irani, *Associate Clinical Professor of Medicine*
B.A. 1963, University of the South; M.D. 1968, George Washington University

Nelson Sumner Irey, *Clinical Professor of Pathology*
B.S. 1935, M.D. 1938, University of Pittsburgh

Dale Hilton Isaacson, *Assistant Clinical Professor of Dermatology and of Medicine*
M.D. 1977, George Washington University

Daniel Isaacson, *Clinical Instructor in Surgery (Otolaryngology)*
B.A. 1955, University of New Mexico; M.D. 1964, University of Innsbruck, Austria

Norman Harry Isaacson, *Clinical Professor of Surgery*
B.A. 1941, M.D. 1944, New York University

Gene Tetsuo Izuno, *Adjunct Associate Professor of Health Care Sciences*
B.S. 1957, Loyola Marymount University; M.D. 1961, Marquette University

Michael John Jackson, *Professor of Physiology*
B.Sc. 1963, University of London, England; Ph.D. 1966, Sheffield University, England

Eugene Robert Jacobs, *Clinical Professor of Radiology*
B.A. 1951, Syracuse University; M.D. 1955, State University of New York Upstate Medical Center

Robert Philip Jacobs, *Associate Professor of Medicine*
M.D. 1968, New York University

Marshall Hannis Jacobson, *Associate Clinical Professor of Medicine*
A.B. 1945, M.D. 1949, George Washington University

Susan Weitz Jaffe, *Instructor in Obstetrics and Gynecology*
B.S. 1973, Cornell University; M.D. 1977, George Washington University

Irwin Sidney Jaffee, *Associate Clinical Professor of Surgery (Otolaryngology)*
B.A. 1952, New York University; M.D. 1956, State University of New York Downstate Medical Center

Lewis Patrick James, *Adjunct Assistant Professor of Pathology*
B.A. 1972, M.D. 1976, St. Louis University

Edmund Ernest Jamieson, *Special Lecturer in Radiology*

Frank Skiff Jannotta, *Associate Professor of Pathology*
A.B. 1951, Williams College; M.D. 1955, University of Pennsylvania

William Dabney Jarman, *Clinical Professor of Urology*
B.S. 1927, Hampden-Sydney College; M.D. 1932, University of Virginia

Jeffrey Alan Jay, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, Amherst College; Ph.D. 1977, Duke University

Melvin E. Jenkins, *Professorial Lecturer in Child Health and Development*
A.B. 1944, M.D. 1946, University of Kansas

Robert Lee Jenkins, *Assistant Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1972, University of Maryland, Baltimore County; M.A. 1974, Loyola College; Ph.D. 1979, University of Oklahoma

Marc Antoine Jerome, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Lycee Philippe Guerrier, Haiti; M.D. 1962, Universite d'Etat d'Haiti

Marilyn Concetta Jerome, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1974, Xavier University; M.D. 1978, University of Cincinnati

Marianne Thieme Jessee, *Assistant Professorial Lecturer in Pathology*
B.S. 1954, Martin Luther University, West Germany

Leslie S. Jewett, *Assistant Professor of Child Health and Development*
B.A. 1968, Michigan State University; M.Ed. 1975, American University; Ed.D. 1980, George Washington University

David Charles Johnson, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1969, M.D. 1973, Yale University

Frank Bacchus Johnson, *Clinical Professor of Pathology*
B.S. 1940, University of Michigan; M.D. 1944, Howard University

Jean Kelroy Johnson, *Assistant Professor of Health Care Sciences*
B.A. 1968, University of Illinois; B.S. 1974, Texas Woman's University; M.S. 1978, University of Wisconsin

Kurt Edward Johnson, *Associate Professor of Anatomy*
B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Thomas Gregory Johnson, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1968, Pennsylvania State University; M.D. 1972, University of Pittsburgh

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

Warren Charles Johnson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1944, Seattle University; M.D. 1947, St. Louis University

Barbara Pendleton Jones, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Wellesley College; M.A. 1974, Ph.D. 1977, Boston University

Evan Anthony Jones, *Adjunct Associate Professor of Medicine*
B.S. 1959, M.B., Ch.B. 1962, University of Birmingham, England; M.R.C.P. 1965, Royal College of Physicians, England; M.D. 1969, University of Birmingham, England

James Walter Jones, *Lecturer in Pathology*
B.S. 1972, University of Nebraska at Omaha; M.S. 1976, George Washington University

Judith Miller Jones, *Assistant Professorial Lecturer in Health Care Sciences*
B.A. 1965, George Washington University; M.A. 1966, Catholic University of America

Phillip Eugene Jones, *Adjunct Instructor in Health Care Sciences*
B.S. 1976, University of Nebraska; M.A. 1981, Webster College

Sidney Robert Jones, *Adjunct Associate Professor of Pathology*
B.S. 1959, D.V.M. 1961, Ph.D. 1977, Kansas State University; M.S. 1967, Texas A&M University

Marion Harvey Jordan, *Assistant Clinical Professor of Surgery*
B.A. 1965, West Georgia College; M.D. 1969, Medical College of Georgia

David Iglauer Joseph, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Yale University; M.D. 1967, Case Western Reserve University

George Joseph, *Assistant Clinical Professor of Child Health and Development*
B.S. 1957, University of Madras, India; M.B., B.S. 1962, Kerala University, India; M.P.H. 1969, Johns Hopkins University

Shelby Harold Josephs, *Assistant Professor of Child Health and Development*
B.A. 1971, University of Pennsylvania; M.D. 1975, Duke University

Joseph Anthony Jurand, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, George Washington University; M.D. 1975, Howard University

John S. Kafka, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1944, Central YMCA Community College; M.S. 1947, University of Chicago; M.D. 1951, Emory University

Hayk Leon Kaftarian, *Clinical Instructor in Child Health and Development*
M.D. 1967, University of Tehran, Iran

Kenneth Roman Kahn, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1971, Doane College

Irwin Howard Kaiser, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1945, Brown University; M.D. 1948, New York Medical College

Joel Philip Kalman, *Clinical Instructor in Medicine*
B.A. 1969, Cornell University; M.D. 1973, State University of New York Upstate Medical Center

Herman Leo Kamenetz, *Clinical Professor of Medicine*
B.A. 1943, B.A. 1944, M.S. 1945, M.D. 1952, University of Paris, France

Suryabala Kanhouwa, *Adjunct Assistant Professor of Pathology*
M.B., B.S. 1962, Gandhi Medical College, India

Tzu-Min Kao, *Associate Professorial Lecturer in Health Care Sciences*
M.D. 1965, Kachsiung Medical College, Taiwan

Albert Zaven Kapikian, *Research Professor of Child Health and Development*
B.S. 1952, City University of New York, Queens College; M.D. 1956, Cornell University

Kenneth Lawrence Kaplan, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1957, B.S. 1958, M.D. 1962, University of Chicago

Sudesh Puri Kapur, *Assistant Professor of Pathology and of Child Health and Development*
M.B., B.S. 1964, Panjab University, India; M.D. 1970, Postgraduate Institute of Medical Education, India

John Alexander Kark, *Associate Clinical Professor of Medicine*
B.A. 1966, M.B. 1966, Oxford University, England; M.D. 1969, Harvard University

Said A. Karmi, *Professor of Urology and of Surgery*
B.S. 1960, M.D. 1964, American University of Beirut, Lebanon

Maya Tolani Karna, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1961, M.G.M. Medical College, India

Walter Watson Karney, *Adjunct Associate Professor of Medicine*
B.A. 1958, Wesleyan University; M.D. 1962, Yale University

Thomas Eugene Kasper, *Clinical Instructor in Urology*
B.A. 1964, Cornell University; M.D. 1969, State University of New York Downstate Medical Center

Evan J. Kass, *Associate Professor of Urology and of Child Health and Development*
M.D. 1968, State University of New York Downstate Medical Center

Mangal Katikineni, *Assistant Clinical Professor of Medicine*
M.D. 1974, Osmania University, India

Martin M. Katz, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1949, City University of New York, Brooklyn College; Ph.D. 1955, University of Texas

Richard Jeffrey Katz, *Assistant Professor of Medicine (Cardiology)*
B.A. 1968, University of Pennsylvania; M.M.S. 1970, Rutgers—The State University; M.D. 1972, New York University

Ronald Alan Katz, *Associate Clinical Professor of Dermatology*
B.S. 1964, University of Cincinnati; M.D. 1969, University of Maryland

Sol Katz, *Special Lecturer in Medicine (Pulmonary Disease)*
B.S. 1935, City University of New York, City College; M.D. 1939, Georgetown University

Barry Theodore Katzen, *Clinical Professor of Radiology*
M.D. 1970, University of Miami

Harvey Irwin Katzen, *Assistant Clinical Professor of Medicine*
B.S. 1971, Georgetown University; M.D. 1975, George Washington University

Jacob Joseph Katzow, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, M.D. 1960, Stanford University

Richard Miles Kaufman, *Associate Clinical Professor of Medicine*
A.B. 1955, M.D. 1958, George Washington University

Ronald Paul Kaufman, *Professor of Medicine; Vice President for Medical Affairs; Executive Dean of the Medical Center*
B.S. 1951, Trinity College, Connecticut; M.D. 1955, University of Pennsylvania

Morton A. Kavalier, *Assistant Clinical Professor of Medicine*
A.B. 1965, University of Pennsylvania, M.D. 1969, Thomas Jefferson University

Frank James Kavanaugh, *Research Professor of Medical and Public Affairs*
B.A. 1956, Lake Forest College

Robert Kayton, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1964, Roosevelt University; M.S. 1967, Ph.D. 1969, University of Massachusetts

Salman Owais Kazmi, *Assistant Clinical Professor of Urology*
B.S. 1961, University of Karachi, Pakistan; M.B., B.S. 1967, University of Dacca, Bangladesh

Albert Edward Keen, *Special Lecturer in Health Care Sciences*

Thomas Patrick Keenan, *Assistant Clinical Professor of Ophthalmology*
B.S. 1963, Manhattan College; M.D. 1967, Georgetown University

Robert I. Keimowitz, *Professor of Medicine and of Health Care Sciences; Associate Dean of the Medical Center for Student Affairs and Admissions*
B.A. 1961, M.S. 1963, M.D. 1965, University of Vermont

Robert West Keisling, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1971, University of Tennessee

Joanne Keene Kelleher, *Assistant Professor of Physiology*
B.S. 1969, St. Louis University, M.A. 1972, Ph.D. 1976, Boston University

John Francis Kelleher, Jr., *Assistant Professor of Child Health and Development*
B.S. 1968, Boston College; M.D. 1972, Yale University

Ruby Lee Keller-Homayssi, *Special Lecturer in Health Care Sciences*
B.S. 1967, Southern University

Martha Rugg Kendall, *Clinical Instructor in Medicine*
B.A. 1969, Wellesley College; M.D. 1976, George Washington University

John C. Kenealy, *Associate Clinical Professor of Urology*
A.B. 1948, Syracuse University; M.D. 1952, State University of New York Upstate Medical Center

Peter I. Kenmore, *Adjunct Professor of Orthopaedic Surgery*
M.D. 1947, Hahnemann Medical College

Katherine Ash Kennedy, *Assistant Professor of Pharmacology*
B.A. 1973, Vanderbilt University, Ph.D. 1977, University of Iowa

Marie-Louise Levy Kennedy, *Associate Professor of Anesthesiology*
B.S. 1943, College de Ville Franche, De Rouergue, France; M.D. 1952, Strasbourg Medical School, France

Richard Alec Kenney, *Professor of Physiology; Chairman of the Department of Physiology*
B.S. 1945, Ph.D. 1947, University of Birmingham, England

Stephen Gabriel Kent, *Associate Professor of Pathology*
A.B. 1956, M.D. 1960, Case Western Reserve University

John Mark Keshishian, *Associate Clinical Professor of Surgery*
M.D. 1950, George Washington University

Samuel Sherwood Kessel, *Clinical Instructor in Child Health and Development*
B.S. (E.E.) 1970, Drexel University; M.D. 1974, Yeshiva University

Craig Martin Kessler, *Associate Professor of Medicine*
B.A. 1969, Duke University; M.D. 1973, Tulane University

Kenneth A. Kessler, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, M.D. 1969, Temple University

Raymond Bernard Kielich, *Adjunct Associate Professor of Child Health and Development*
D.D.S. 1945, University of Buffalo

Randall Wayne Killian, *Adjunct Instructor in Radiology*

Chul Kim, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1968, Seoul National University, South Korea

Hyun Wha Kim, *Associate Professor of Child Health and Development*
M.D. 1942, To-Ho University, Japan

Christina Eve Jensen Kimball, *Associate Clinical Professor of Child Health and Development*
B.A. 1961, Wellesley College; M.D. 1965, University of Virginia

Phyllis Dawn Kind, *Professor of Microbiology and of Medicine*
B.A. 1955, Montana State University; M.S. 1956, Ph.D. 1960, University of Michigan

Joseph D. B. King, *Associate Clinical Professor of Medicine*
B.A. 1941, Princeton University; M.D. 1944, Johns Hopkins University

Lawrence Marion King, Jr., *Associate Clinical Professor of Ophthalmology*
B.S. 1948, Louisiana Tech University; M.D. 1953, Louisiana State University in New Orleans

Lucy Jane King, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1954, M.D. 1958, Washington University

Robert A. King, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1963, Cornell University; B.A. 1965, Oxford University, England; M.D. 1968, Harvard University

Nigar Kirmani, *Assistant Professor of Medicine*
M.B., B.S. 1973, King Edward Medical College, Pakistan

Stanley Martin Kirson, *Associate Clinical Professor of Surgery*
A.B., M.D. 1957, George Washington University

Hans Joachim Klapproth, *Associate Clinical Professor of Urology*
M.D. 1951, University of Hamburg, West Germany

Hanna Klaus, *Associate Clinical Professor of Obstetrics and Gynecology*
A.B. 1948, M.D. 1950, University of Louisville

Jack Kleh, *Associate Clinical Professor of Medicine*
A.B. 1942, M.D. 1944, George Washington University

Joyce Ellen Klein, *Adjunct Instructor in Health Care Sciences*
B.S. 1980, George Washington University

Bradford Allan Kleinman, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1972, M.D. 1976, University of Maryland

Joel Edward Kleinman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1966, M.D. 1973, Ph.D. 1974, University of Chicago

Prudence Parcher Kline, *Assistant Professor of Health Care Sciences (Emergency Medicine)*
B.A. 1972, Oberlin College; M.D. 1978, College of Medicine and Dentistry of New Jersey

Raymond William Klofkorn, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1960, University of Wyoming; M.D. 1964, University of Colorado

Philip Klubes, *Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College; M.S. 1959, Ph.D. 1962, University of Minnesota

Anne Lowe Knasel, *Special Lecturer in Child Health and Development*
A.B. 1963, Lake Erie College; M.D. 1968, Boston University

William A. Knaus, *Associate Professor of Anesthesiology and Associate Research Professor of Clinical Engineering*
B.S. 1968, Widener College; M.D. 1972, West Virginia University

Martin Stanley Kneller, *Assistant Clinical Professor of Radiology*
B.S. 1963, City University of New York, City College; M.D. 1967, State University of New York Downstate Medical Center

Stanley Marc Knoll, *Assistant Clinical Professor of Surgery*
B.S. 1964, University of Pittsburgh; M.D. 1968, University of Health Sciences/Chicago Medical School

Arthur Irwin Kobrine, *Professor of Neurological Surgery*
B.A. 1964, M.D. 1968, Northwestern University; Ph.D. 1979, George Washington University

Barbara May Koch, *Assistant Professor of Child Health and Development*
B.A. 1968, Clark University; M.D. 1972, Boston University

Edward Graeme Koch, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1964, M.A. 1965, University of California, Los Angeles; M.D. 1969, George Washington University

Edward S. Koenig, *Adjunct Instructor in Health Care Sciences*
B.A. 1969, Florida State University; B.S. 1978, George Washington University

Marilyn Jean Koering, *Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Leonard L. Kogan, *Clinical Instructor in Ophthalmology*
M.D. 1957, University of Maryland

Wilfried Matthaeus Kokott, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1949, University of Goettingen, West Germany

Marvin L. Kolkin, *Clinical Instructor in Surgery*
M.D. 1947, New York Medical College

George Frederick Kolodner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Williams College; M.D. 1967, University of Rochester

Edward Ronald Kolvereid, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Ohio University; M.D. 1960, Ohio State University

George Matthew Korengold, *Clinical Instructor in Child Health and Development*
B.A. 1968, University of Pennsylvania; M.D. 1972, George Washington University

Marvin Curtis Korengold, *Assistant Clinical Professor of Neurology*
D.D.S. 1945, B.S. 1947, M.B. 1949, M.D. 1950, University of Minnesota

Louis Y. Korman, *Assistant Professor of Medicine and of Physiology*
B.A. 1967, City University of New York, Hunter College; B.Med.Sc. 1972, Free University, Belgium; M.D. 1975, State University of New York Upstate Medical Center

Paul Lee Kornblith, *Professorial Lecturer in Neurological Surgery*
B.A. 1958, Temple University; M.D. 1962, Thomas Jefferson University

Andre Kornhauser, *Adjunct Associate Professor of Dermatology*
B.S., M.S. 1955, Ph.D. 1962, University of Zagreb, Yugoslavia

Katalin Soltesz Korossy, *Assistant Clinical Professor of Dermatology*
M.D. 1970, Debrecen Medical University, Hungary

Jack Martin Korsower, *Clinical Professor of Radiology*
B.S. 1962, City University of New York, City College; M.D. 1966, Yeshiva University

Bernardo Kotelanski, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Buenos Aires, Argentina

Eduard V. Kotlyarov, *Associate Clinical Professor of Radiology*
M.D. 1965, Ph.D. 1968, D.M.S. 1971, First Moscow Medical Institute, U.S.S.R.

Herbert Louis Kotz, *Clinical Professor of Obstetrics and Gynecology*
A.B. 1953, M.D. 1956, George Washington University

Spiridon Koulouris, *Associate Professor of Neurological Surgery*
M.D. 1960, University of Salonica, Greece

Thomas Leo Koury, *Special Lecturer in Surgery*
D.D.S. 1948, M.D. 1952, Temple University

Thomas Michael Koval, *Associate Research Professor of Radiology*
B.S. 1972, Pennsylvania State University; M.S. 1974, Ph.D. 1976, Ohio State University

Suzan Kovarick, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1974, University of Vermont; M.D. 1978, George Washington University

Michael Kenneth Kowalski, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1967, Kings College, Pennsylvania; M.D. 1971, Temple University

Louis Kozloff, *Assistant Clinical Professor of Surgery*
B.A. 1965, M.D. 1969, University of Pennsylvania

Barton L. Kraff, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, University of Rochester; M.D. 1965, State University of New York at Buffalo

David Kram, *Adjunct Associate Professor of Radiology*
B.A. 1971, Ph.D. 1976, University of Connecticut

Celia Anne Kramer, *Assistant Professor of Medicine*
B.S. 1970, M.D. 1974, University of Maryland

Norman Clifford Kramer, *Professor of Medicine*
B.S. 1948, The Citadel; M.S. 1950, M.D. 1954, George Washington University

Robert Kramer, *Clinical Instructor in Medicine*
B.A. 1949, Indiana University; M.D. 1956, University of Geneva, Switzerland

Steven Hyman Krasnow, *Assistant Professor of Medicine*
B.A. 1969, Clark University; M.D. 1974, Loyola University of Chicago

Ruediger Kratz, *Assistant Clinical Professor of Neurology*
M.D. 1973, University of Chicago

Ira Paul Krefting, *Assistant Clinical Professor of Medicine*
B.A. 1970, New York University; M.D. 1974, State University of New York Downstate Medical Center

Bruce Robert Kressel, *Adjunct Assistant Professor of Medicine*
A.B. 1969, Lafayette College; M.D. 1973, Tufts University

Leo Edward Kreuz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1960, Harvard University; M.D. 1964, Johns Hopkins University

Malvin Donald Krinn, *Assistant Clinical Professor of Ophthalmology*
M.D. 1965, University of Illinois

Paul H. J. Krogh, *Adjunct Instructor in Surgery (Oral Surgery)*
B.S. 1956, Washington and Lee University; D.D.S. 1960, University of North Carolina; M.S.D. 1963, University of Minnesota

Norma June Cochran Kropp, *Adjunct Instructor in Health Care Sciences*

Morris Edward Krucoff, *Associate Clinical Professor of Surgery (Otolaryngology)*
B.S. 1937, M.D. 1942, George Washington University

Dean E. Krueger, *Research Professor of Statistics and Ophthalmology*
A.B. 1938, M.A. 1942, University of Chicago; M.S. 1959, Columbia University

Thomas Bayard Kulb, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1974, M.D. 1977, Indiana University

Ajit Kumar, *Associate Professor of Biochemistry*
Ph.D. 1968, University of Chicago

Isabel Goldenberg Kuperschmit, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1967, M.D. 1973, University of Buenos Aires, Argentina

Walter Kurland, *Assistant Professor of Medicine*
B.S. 1942, M.D. 1945, George Washington University

Ronald Dale Kurstin, *Assistant Clinical Professor of Surgery*
B.A. 1967, Tulane University; M.D. 1971, George Washington University

William Kurstin, *Assistant Clinical Professor of Medicine*
B.S. 1941, M.D. 1943, George Washington University

Ronald B. Kurz, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1955, New York University; Ph.D. 1960, Indiana University

David Howard Kushner, *Professorial Lecturer in Obstetrics and Gynecology*
B.S. 1926, M.D. 1928, Georgetown University

Edward Irving Kushner, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. in Med. 1947, University of Nebraska; M.D. 1949, New York Medical College

Jack Kushner, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1960, Tulane University; M.D. 1964, University of Alabama in Birmingham

Truvor Vadym Kuzmowych, *Assistant Professor of Medicine*
A.B. 1965, La Salle College; M.D. 1969, Thomas Jefferson University

James Thomas Kvach, *Assistant Research Professor of Microbiology*
B.S. 1968, Ohio State University; M.S. 1973, Ph.D. 1977, Miami University

Arnold Martin Kwart, *Associate Clinical Professor of Urology*
B.S. 1964, University of Florida; M.D. 1968, Duke University

Panagiotis A. Labropoulos, *Instructor in Orthopaedic Surgery*
M.D. 1971, University of Athens, Greece

William Thurston Lady, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1938, George Washington University

Alfred Shing-Tai Lai, *Clinical Instructor in Medicine*
M.D. 1970, National Taiwan University

Barry J. Landau, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1963, Columbia University; M.D. 1966, New York University

Howard Milton Lando, *Assistant Clinical Professor of Medicine*
B.S. 1971, University of Virginia; M.D. 1975, Medical College of Virginia of Virginia Commonwealth University

Jeffrey Harris Lane, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, University of Rochester; M.D. 1975, Albany Medical College of Union University

Paul Allan Lange, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, M.D. 1967, University of Chicago

David Arthur Lanham, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1955, St. Louis University

David Lloyd Lanter, *Clinical Instructor in Ophthalmology*
B.S. 1959, City University of New York, Queens College; M.D. 1963, New York Medical College

Anita Iff Lao, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1963, George Washington University

Francis Gerald LaPiana, *Associate Clinical Professor of Ophthalmology*
M.D. 1962, George Washington University

John C. LaRosa, *Professor of Medicine and of Health Care Sciences*
B.S. 1961, M.D. 1965, University of Pittsburgh

John Walter Larsen, Jr., *Associate Professor of Obstetrics and Gynecology*
B.A. 1964, Dartmouth College; M.D. 1968, Cornell University

Joseph Bruce Laskowski, *Special Lecturer in Health Care Sciences*

Peter Charles Latkin, *Assistant Clinical Professor of Medicine and of Child Health and Development*
B.S. 1964, College of William and Mary; M.D. 1968, New York Medical College

Floren Kyle Lauber, *Special Lecturer in Health Care Sciences*

Henry Prather Laughlin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1937, Ursinus College; M.D. 1941, Temple University

Robert Laureno, *Assistant Clinical Professor of Neurology*
B.A. 1967, M.D. 1971, Cornell University

Robert Alan Lavine, *Associate Professor of Physiology and of Neurology*
B.S. 1962, Ph.D. 1969, University of Chicago

Stanford A. Lavine, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, M.D. 1954, University of Maryland

Walter Edward Lawrinson, *Associate Clinical Professor of Neurological Surgery*
B.S. 1960, M.D. 1964, Case Western Reserve University

Allan Michael Lazarus, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1965, City University of New York, Brooklyn College; M.D. 1969, New York University

Robert Paul Leach, *Adjunct Instructor in Health Care Sciences*

Arnold Albert Lear, *Associate Clinical Professor of Medicine*
M.D. 1950, Harvard University

Paul David Leber, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1958, Hamilton College; M.D. 1963, New York University

J. Martin Lebowitz, *Assistant Clinical Professor of Urology*
B.A. 1960, M.D. 1963, Northwestern University

Martin Edward Lederman, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.A. 1960, City University of New York, Brooklyn College; M.D. 1964, Yeshiva University

Cheng-Chun Lee, *Professorial Lecturer in Pharmacology*
B.S. 1945, M.S. 1948, National Central University, China; M.S. 1950, Ph.D. 1952, Michigan State University

Don Seung Lee, *Associate Professor of Anesthesiology*
M.D. 1966, Catholic Medical College, South Korea

Sang Nam Lee, *Associate Clinical Professor of Radiology (Therapy)*
M.D. 1965, Catholic Medical College, South Korea

Son Taek Lee, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1962, Seoul National University, South Korea

Leonard Lefkowitz, *Associate Clinical Professor of Child Health and Development*
A.B. 1957, Alfred University; M.D. 1962, University of Health Sciences/Chicago Medical School

Glenn Duane Legler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1954, St. Olaf College; M.D. 1958, University of Wisconsin

Paul Celestin Legolvan, *Clinical Professor of Pathology*
M.D. 1940, University of Michigan

Harold Bernard Lehrman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1939, Bowdoin College; M.D. 1943, Tufts University

Susan Leibenhaut, *Clinical Instructor in Medicine*
B.S. 1972, Massachusetts Institute of Technology; M.D. 1975, Yeshiva University

Roy Harel Leiboff, *Assistant Professor of Medicine*
B.A., B.S. 1972, Tufts University; M.D. 1975, New York Medical College

Sanford Leon Leikin, *Professor of Child Health and Development*
M.D. 1947, University of Louisville

Roonari Pitayatonakarn Lekagul, *Assistant Clinical Professor of Child Health and Development*
M.D. 1964, Chulalongkorn University, Thailand

Fred Leonard, *Research Professor of Medicine (Rehabilitation Medicine) and of Orthopaedic Surgery; Associate Dean of the Medical Center, for Research*
B.S. 1938, University of Arkansas; M.S. 1942, Ph.D. 1947, Polytechnic Institute of New York

Steven David Lerner, *Assistant Clinical Professor of Medicine*
B.A. 1972, M.D. 1976, University of Minnesota

Lawrence Stephen Lessin, *Professor of Medicine and of Pathology*
M.D. 1962, University of Chicago

Gordon Sparks Letterman, *Professor of Surgery (Plastic Surgery)*
A.B. 1937, B.S. in Med. Sc. 1940, M.D. 1941, Washington University

Arthur Jerome Levens, *Associate Clinical Professor of Neurology*
B.S. 1940, M.D. 1944, University of Wisconsin

Stanley M. Levenson, *Assistant Research Professor of Radiology*
B.S. 1964, University of Wisconsin; M.D. 1968, University of Maryland

Odette Levesque, *Adjunct Instructor in Health Care Sciences*
B.S.N. 1972, University of Maine; B.S. 1979, George Washington University

L. David Levi, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Harvard University; M.D. 1964, Cornell University

Barry Jay Levin, *Assistant Clinical Professor of Surgery*
B.A. 1966, M.D. 1970, Emory University

Jack Louis Levine, *Associate Clinical Professor of Surgery (Otolaryngology) and of Child Health and Development*
M.D. 1938, George Washington University

Leonard S. Levine, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1955, State University of New York Downstate Medical Center

Paul H. Levine, *Assistant Clinical Professor of Medicine*
B.A. 1959, Cornell University; M.D. 1963, University of Rochester

Richard F. Levine, *Associate Professor of Medicine*
B.A. 1962, M.D. 1966, Johns Hopkins University

Robert Howard Levitt, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1968, M.D. 1972, State University of New York at Buffalo

Arnold Glenn Levy, *Associate Clinical Professor of Medicine*
B.A. 1968, M.D. 1971, George Washington University

Charles Steven Levy, *Assistant Professor of Medicine*
B.A. 1969, Washington University; M.D. 1973, Cornell University

Ann Maria Lewicki, *Professor of Radiology*
A.B. 1956, Albion College; M.D. 1959, Wayne State University

James Hendricks Lewis, *Assistant Professor of Medicine*
B.A. 1971, Oberlin College; M.D. 1975, State University of New York Downstate Medical Center

Randall Jeffrey Lewis, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1965, Yale University; M.D. 1969, Harvard University

Robert Todd Lewit, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, M.D. 1963, Harvard University

Choh Luh Li, *Clinical Professor of Neurological Surgery*
M.D. 1942, National Medical College of Shanghai, China; M.S. 1950, Ph.D. 1954, McGill University

Joseph Liberman, *Adjunct Assistant Professor of Neurology*
B.A. 1969, University of Wisconsin; M.D. 1973, New York University

Joel E. Lichtenstein, *Professorial Lecturer in Radiology*
B.E.E. 1964, Cornell University; M.S. 1966, M.D. 1972, Ohio State University

Manfred Wilhelm Lichtmann, *Professor of Anesthesiology*
B.S. 1954, Wagner College; M.D. 1973, Thomas Jefferson University

Edwin James Lieberman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1955, University of California, Berkeley; M.D. 1958, University of California, San Francisco; M.P.H. 1963, Harvard University

Michael David Lieberman, *Special Lecturer in Health Care Sciences*
A.B. 1962, University of Pennsylvania; M.D. 1966, University of Health Sciences/Chicago Medical School

Roger David Lieberman, *Adjunct Assistant Professor of Health Care Sciences*
B.A. 1967, City University of New York, Hunter College; D.O. 1974, Kansas City College of Osteopathic Medicine

William Edward Lightfoote II, *Assistant Clinical Professor of Neurology*
A.B. 1963, Grinnell College; M.D. 1967, Howard University

Clarence C. Lindquist, *Adjunct Instructor in Surgery (Oral Surgery)*
A.B. 1966, Catholic University of America; D.D.S. 1970, Georgetown University

Joseph Lindsay, Jr., *Professor of Medicine*
B.S. 1954, Clemson University; M.D. 1958, Emory University

Craig William Linebaugh, *Associate Professor of Speech and Associate Research Professor of Medicine*
B.A. 1970, Lebanon Valley College; M.A. 1974, Ph.D. 1975, Temple University

Ching Clifton Ling, *Professor of Radiology*
B.S. 1965, Oregon State University; M.S. 1967, Ph.D. 1971, University of Washington

Ralph Burgess Lingeman, *Associate Professor of Pathology*
M.D. 1953, Indiana University

Steven Douglas Linn, *Adjunct Instructor in Health Care Sciences*
B.S. in Engr. 1973, Colorado State University

Lewis Edward Lipkin, *Adjunct Professor of Clinical Engineering*
B.A. 1945, M.D. 1949, New York University

Daniel Gordon Lipman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1940, Middlesex Hospital Medical School, England

Edward Robert Lipsit, *Assistant Clinical Professor of Radiology*
B.A. 1971, Yeshiva University; M.D. 1975, Georgetown University

Steven Howard Lipsius, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Obstetrics and Gynecology*
B.S. 1962, St. Joseph's College, Pennsylvania; M.D. 1963, M.A. 1965, Temple University

Ace Lipson, *Assistant Clinical Professor of Medicine*
B.A. 1969, New York University; M.D. 1973, Washington University

George Liss, *Clinical Instructor in Ophthalmology*
B.A. 1955, M.D. 1958, George Washington University; M.S. 1964, Marquette University

William Gerald Littman, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1967, Pennsylvania State University; M.D. 1972, University of Miami

Leon McNeely Liverett, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Butler University; M.D. 1945, Indiana University

Amy Bookman Livingood, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1971, State University of New York at Stony Brook; M.A. 1973, Ph.D. 1977, University of Maryland

Raymond Edward Lockard, *Associate Research Professor of Biochemistry*
B.S. 1966, Syracuse University; Ph.D. 1972, University of Cincinnati

Mortimer Winfield Lockett, *Associate Clinical Professor of Health Care Sciences*
B.A. 1959, College of William and Mary; M.Ed. 1969, University of Virginia; Ed.D. 1974, American University

John Hayes Lodge, *Assistant Clinical Professor of Ophthalmology*
A.B. 1947, West Virginia University; M.D. 1951, Johns Hopkins University

Robert G. Loeffler, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1963, Columbia University; M.D. 1967, Yeshiva University

Glyndon Allen Logsdon, *Clinical Instructor in Health Care Sciences*

James Walling Long, *Adjunct Assistant Professor of Medicine*
M.D. 1943, George Washington University

John A. Long, Jr., *Associate Professorial Lecturer in Radiology*
B.S. 1969, University of Notre Dame; M.D. 1973, Georgetown University

John Harold Lossing, *Adjunct Assistant Professor of Neurology*
B.S. 1966, M.D. 1970, University of Michigan

Ruth Butler Lott, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1957, M.S.W. 1960, University of North Carolina

Samuel Dennis Loube, *Clinical Professor of Medicine*
A.B. 1941, M.D. 1943, George Washington University

Chow-Eng Low, *Assistant Research Professor of Biochemistry*
B.S. 1962, Chung Chi College, Hong Kong; M.S. 1966, Texas Southern University; Ph.D. 1970, University of Texas

Teresa Ling-Chun Kao Low, *Associate Research Professor of Biochemistry*
B.S. 1962, Tunghai University, Taiwan; M.S. 1966, Texas Woman's University; Ph.D. 1970, University of Texas

John Andrew Lowe, *Assistant Clinical Professor of Child Health and Development*
B.A. 1964, Harvard University; M.D. 1968, Tufts University

Naomi Corman Luban, *Associate Professor of Child Health and Development*
B.A. 1968, Connecticut College; M.D. 1972, City University of New York, Mount Sinai School of Medicine

Norman Alan Luban, *Assistant Clinical Professor of Neurology*
B.A. 1967, State University of New York at Buffalo; M.D. 1971, Yeshiva University

Jean Pitner Lucas, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.A. 1944, B.S. 1946, University of Mississippi; M.D. 1948, George Washington University

Glenn Howard Luedtke, *Adjunct Instructor in Health Care Sciences*

Stanley Louis Lugerner, *Assistant Professor of Health Care Sciences and of Medicine*
B.A. 1973, State University of New York at Buffalo; M.D. 1978, State University of New York Downstate Medical Center

James Lindsay Luke, *Clinical Professor of Pathology (Forensic)*
B.S. 1956, Columbia University; M.D. 1960, Case Western Reserve University

Robert John Lull, *Associate Clinical Professor of Radiology*
B.A. 1962, Canisius College; M.D. 1966, Albany Medical College of Union University

Penn Lupovich, *Assistant Clinical Professor of Pathology*
A.B. 1959, Johns Hopkins University; M.D. 1964, University of Health Sciences Chicago Medical School

Thomas Joseph Lustberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1965, University of Cincinnati; M.D. 1970, Vanderbilt University

Warren Edward Lux, Jr., *Assistant Clinical Professor of Neurology*
B.A. 1965, Amherst College; M.D. 1970, New York University

John William Lyles, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.M.E. 1954, Cornell University; M.D. 1970, George Washington University

Donald Francis Lynch, Jr., *Adjunct Associate Professor of Health Care Sciences*
M.D. 1971, University of Virginia

Dorcas Joanne Lynn, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.S. 1970, Dickinson College; M.D. 1974, Boston University; M.A. in Sp.Std. 1982, George Washington University

Carl Charles MacCartee, Jr., *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1963, Duke University; M.D. 1967, Georgetown University

John Stephen MacDonald, *Adjunct Associate Professor of Medicine*
A.B. 1965, B.M.S. 1967, Dartmouth College; M.D. 1969, Harvard University

Mhairi Graham MacDonald-Ginzburg, *Assistant Professor of Child Health and Development*
B.S. 1969, M.B., Ch.B. 1969, University of Edinburgh, Scotland

Steven D. Macht, *Assistant Professor of Surgery (Plastic Surgery)*
B.S. 1966, D.D.S. 1969, University of Maryland; M.D. 1972, George Washington University

Thayer Mills Mackenzie, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1944, Harvard University; M.D. 1947, Johns Hopkins University

Beryce W. MacLennan, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, London School of Economics, England; Ph.D. 1960, London University, England

James Don MacLowry, *Adjunct Associate Professor of Microbiology*
B.A. 1956, Yale University; M.D. 1960, Columbia University

Ivan Vasil Magal, *Clinical Instructor in Medicine*
Th.B. 1944, Baptist Theological Seminary, Hungary; A.B. 1948, Eastern Mennonite College; B.S. 1949, Lebanon Valley College; M.D. 1954, Medical College of Virginia of Virginia Commonwealth University

Csaba Ladislo Magassy, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.S. 1958, M.D. 1962, Creighton University

Daniel Bruce Magilavy, *Associate Professor of Child Health and Development and of Medicine*
A.B. 1968, Washington University; M.D. 1972, Ohio State University

Mark Aaron Mahar, *Adjunct Instructor in Health Care Sciences*

Iradj Mahdavi, *Associate Clinical Professor of Child Health and Development*
M.D. 1956, University of Tehran, Iran

John Gail Maier, *Clinical Professor of Radiology*
M.D. 1952, St. Louis University; M.S. 1959, University of Colorado; Ph.D. 1963, University of Rochester

Massoud Majd, *Professor of Radiology and of Child Health and Development*
M.D. 1960, University of Tehran, Iran

Martin Miles Malawer, *Assistant Professor of Orthopaedic Surgery and of Child Health and Development*
A.B. 1955, State University of New York at Buffalo; M.D. 1969, New York University

Frank William Maletz, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1974, University of Pennsylvania; M.D. 1978, Thomas Jefferson University

Jocelyn Ruth Schoen Malkin, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1947, Columbia University; M.D. 1952, Yale University

Kalisankar Mallik, *Associate Research Professor of Medicine*
B.S. 1959, B.Tech. 1961, M.Tech. 1962, Calcutta University, India; M.S. 1969, George Washington University

John R. Maloney, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Wake Forest University; M.D. 1972, Temple University

Harold George Mandel, *Professor of Pharmacology, Chairman of the Department of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Harry Armstrong Mangold, *Assistant Clinical Professor of Child Health and Development*
B.A. 1950, College of Wooster; B.D. 1953, McCormick Theological Seminary; M.D. 1964, University of Cincinnati

Emanuele Mannarino, *Associate Clinical Professor of Neurological Surgery*
M.D. 1951, University of Rome, Italy; M.D. 1963, Duke University

Paul Jerome Marangos, *Professorial Lecturer in Biochemistry*
B.A. 1969, Rhode Island College; Ph.D. 1973, University of Rhode Island

Allen Elias Marans, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1949, Georgetown University

Devra C. Marcus, *Assistant Clinical Professor of Medicine*
B.A. 1961, Brandeis University; M.D. 1966, Stanford University

William Yale Marcus, *Clinical Instructor in Surgery*
A.B. 1949, M.D. 1954, Temple University

Paul Mardelli, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1971, M.D. 1976, American University of Beirut, Lebanon

Dan Alden Marden, *Adjunct Assistant Professor of Radiology*
B.A. 1977, George Washington University

Andrew Menges Margileth, *Adjunct Professor of Child Health and Development*
B.A. 1942, Washington and Jefferson College; B.S. 1944, Massachusetts Institute of Technology; M.D. 1947, University of Cincinnati

Carl Ira Margolis, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1958, Columbia University; M.D. 1963, University of Basel, Switzerland

Richard Sheldon Margolis, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1965, Pennsylvania State University; M.D. 1969, George Washington University

David Mervyn Margulies, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Columbia University; M.D. 1961, Northwestern University

Irwin Henley Marill, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1950, Brown University; M.D. 1954, Hahnemann Medical College

Stanley C. Marinoff, *Associate Clinical Professor of Obstetrics and Gynecology*
A.B. 1958, University of Pennsylvania; M.D. 1962, University of Health Sciences Chicago Medical School; M.P.H. 1970, Harvard University

Bruce Michael Markle, *Assistant Professor of Radiology and of Child Health and Development*
A.B. 1970, Brown University; M.D. 1974, Yale University

John Lloyd Marlow, *Assistant Professor of Obstetrics and Gynecology*
B.S. 1957, Brigham Young University; M.D. 1961, George Washington University

Barry Joel Maron, *Assistant Research Professor of Child Health and Development*
B.A. 1963, Occidental College; M.D. 1968, Tulane University

John Daughtry Marriott, *Associate Clinical Professor of Radiology*
A.B. 1958, M.D. 1962, University of North Carolina

William Laverne Marsh, *Professor of Pathology and of Anesthesiology*
B.S. 1942, Purdue University; M.D. 1946, State University of New York at Buffalo

Leon Alponse Martel, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1947, Georgetown University

Dean Harrington Martin, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1950, George Washington University

Neil F. Martin, *Clinical Instructor in Ophthalmology*
A.B. 1972, Harvard University; M.D. 1976, Johns Hopkins University

Mary Jean Matthews, *Clinical Professor of Pathology*
B.S. 1946, M.D. 1949, George Washington University

Daniel Davis Maxwell, *Associate Clinical Professor of Radiology*
B.A. 1963, M.D. 1968, Emory University

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia Commonwealth University; M.S. 1955, Temple University; Ph.D. 1960, Vanderbilt University

Hugh Alexander McAllister, *Professorial Lecturer in Medicine*
B.S. 1961, Davidson College; M.D. 1966, University of North Carolina

Richard Allen McConnaughy, *Assistant Clinical Professor of Medicine (Cardiology)*
B.S. 1959, American University; M.D. 1963, University of Michigan

Jerry Kenneth McCown, *Adjunct Instructor in Health Care Sciences*

Charles Walter McCutchen, *Assistant Clinical Professor of Orthopaedic Surgery (Biomechanics)*
B.A. 1950, Princeton University; M.S. 1952, Brown University; Ph.D. 1957, Cambridge University, England

Robert LeRoy McDowell, Jr., *Associate Clinical Professor of Child Health and Development*
B.A. 1970, M.D. 1974, Harvard University

Norman L. McElroy, *Adjunct Assistant Professor of Radiology*
B.A. 1972, M.A. 1975, George Washington University

James Jerry McFarland, *Clinical Professor of Surgery (Otolaryngology) and of Child Health and Development*
B.S. 1935, Cumberland College of Tennessee; M.D. 1938, University of Tennessee

Dale Elroy McFarlin, *Adjunct Professor of Neurology*
B.A. 1957, M.D. 1961, Vanderbilt University

Willis Alexander McGill II, *Associate Professor of Anesthesiology and of Child Health and Development*
B.S. 1963, Westminster College; M.D. 1967, University of Pittsburgh

Larry McGowan, *Professor of Obstetrics and Gynecology*
B.S. 1950, Millikin University; B.S. in Med. 1952, M.D. 1954, University of Illinois

Brady Piersol McKaig, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1957, University of Notre Dame; M.D. 1961, Cornell University

Douglas William McKay, *Professor of Orthopaedic Surgery and of Child Health and Development*
B.A. 1951, University of Maine; M.D. 1955, Tufts University

William Prentiss McKelway, *Clinical Professor of Obstetrics and Gynecology*
A.B. 1943, Washington and Lee University; M.D. 1950, George Washington University

Donald Harrison McKnew, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1955, Yale University; M.D. 1961, Johns Hopkins University

John Johnson McMillan, *Associate Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1943, Wake Forest University; M.A. 1948, Ph.D. 1951, Duke University

William James McSweeney, *Professor of Radiology and of Child Health and Development*
B.S. 1957, College of the Holy Cross; M.D. 1961, University of Vermont

Henry Michael Meagher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1967, Georgetown University

Ann Elizabeth Medinger, *Assistant Professor of Medicine*
B.A. 1967, Carleton College; M.D. 1971, University of Pennsylvania

John Edmond Meeks, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, Hendrix College; M.D. 1957, University of Tennessee

Elizabeth S. Meid, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
A.B. 1967, Oberlin College; Ph.D. 1971, Yale University

Gordon Weed Mella, *Associate Clinical Professor of Child Health and Development*
B.S. 1953, Ursinus College; M.D. 1956, Thomas Jefferson University

Robert Seamen Melville, *Clinical Professor of Pathology (Laboratory Medicine)*
A.B. 1932, Clark University; Ph.D. 1950, University of Iowa

Sander Holstein Mendelson, *Assistant Professor of Medicine*
B.A. 1956, Wesleyan University; M.D. 1960, New York University

Wallace Brand Mendelson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, University of Texas; M.D. 1969, Washington University

Nicholas Mendjuk, *Clinical Instructor in Medicine*
M.D. 1964, University of Madrid, Spain

Jean Hugues Menetrez, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1942, University of Besançon, France; M.D. 1950, McGill University

Gertrud Weber Mergner, *Associate Professor of Anesthesiology*
M.D. 1967, University of Iowa

John Frederick Mermel, *Associate Clinical Professor of Medicine*
B.S. 1956, Georgetown University; M.D. 1960, George Washington University

Carl Ronald Merril, *Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

William Dellinger Merritt, *Assistant Research Professor of Biochemistry*
B.A. 1969, Colby College; Ph.D. 1975, Purdue University

Jerry Francis Meyer, *Associate Clinical Professor of Medicine*
M.D. 1963, University of Chicago

Barbara Anne Meyer Meyers, *Assistant Clinical Professor of Medicine*
A.B. 1961, Bryn Mawr College; M.D. 1968, George Washington University

Frederick Meyers, *Assistant Clinical Professor of Medicine*
B.S. 1955, Purdue University; M.D. 1959, University of Cincinnati

Herman Arnold Meyersburg, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1933, M.D. 1938, New York University

Morris Irwin Michael, *Special Lecturer in Child Health and Development*
A.B. 1938, Cornell University; M.D. 1942, George Washington University

Frank Murray Midgley, *Associate Professor of Surgery and of Child Health and Development*
A.B. 1951, Princeton University; M.D. 1955, Albany Medical College of Union University

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmental Health*
A.B. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S. in Hyg. 1952, Harvard University

David Richard Miller, *Clinical Instructor in Child Health and Development*
B.A. 1971, Case Western Reserve University; M.D. 1975, University of Vermont

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1948, George Washington University

Gary Howard Miller, *Assistant Clinical Professor of Medicine*
B.A. 1973, Cornell University; M.D. 1977, New York University

George Francis Miller, Jr., *Assistant Clinical Professor of Surgery (Otolaryngology)*
M.D. 1958, George Washington University

Glenn Howard Miller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, University of Iowa; M.D. 1966, University of Chicago

Harry Charles Miller, Jr., *Professor of Urology; Chairman of the Department of Urology*
B.A. 1950, Amherst College; M.D. 1954, Yale University

Ira Miller, *Special Lecturer in Surgery*
B.A. 1951, Columbia University; M.D. 1956, University of Buffalo

Laurence Herbert Miller, *Assistant Clinical Professor of Dermatology*
B.S. 1956, Muhlenberg College; M.D. 1961, University of Lausanne, Switzerland

Marilea Kay Miller, *Assistant Professor of Child Health and Development*
B.A. 1969, Kalamazoo College; M.D. 1973, University of Michigan

Stanley Charles Miller, *Special Lecturer in Health Care Sciences*

Valery Thornton Miller, *Assistant Clinical Professor of Medicine*
B.A. 1958, M.D. 1961, George Washington University

Frances Kennedy Millican, *Adjunct Associate Professor of Psychiatry and Behavioral Sciences*
B.S. 1938, George Peabody College for Teachers; M.S. 1946, M.D. 1948, University of Tennessee

Richard Arthur Millington, *Associate Clinical Professor of Health Care Sciences*
B.A. 1952, M.D. 1956, University of Iowa; M.S. 1961, University of Rochester; M.P.H. 1965, University of California, Berkeley

Dorothy Erica Millon, *Clinical Instructor in Medicine*
B.A. 1946, M.A. 1948, University of California at Los Angeles; M.D. 1955, University of Chicago

Mitchell Mills, *Clinical Professor of Surgery*
A.B. 1952, Princeton University; M.D. 1956, Cornell University

Gregory John Milmoe, *Assistant Professor of Surgery (Otolaryngology) and of Child Health and Development*
B.S. 1969, University of Notre Dame; M.D. 1973, University of Chicago

Irvin Donald Milowe, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1953, Columbia University; M.D. 1957, Cornell University

Harvey Nelson Mininberg, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1960, Brandeis University; M.D. 1965, Yeshiva University

Harold Stanley Mirsky, *Associate Clinical Professor of Medicine*
B.S. 1959, City University of New York, Brooklyn College; M.D. 1964, State University of New York Upstate Medical Center

Donald E. Mitchell, *Associate Clinical Professor of Dermatology*
B.S. 1954, M.D. 1957, University of North Carolina

Bernhard Theodore Mittemeyer, *Clinical Professor of Urology*
B.S. 1952, Moravian College; M.D. 1956, Temple University

Sigmund Mittler, *Associate Clinical Professor of Radiology*
B.S. 1958, M.D. 1964, Universidad Central de Venezuela

Charles Robert Mock, *Assistant Professor of Child Health and Development*
A.B. 1959, M.D. 1963, University of Maryland

Albert Jay Modlin, *Associate Clinical Professor of Child Health and Development*
B.S. 1948, M.S. 1949, M.D. 1954, George Washington University

Barry Modlin, *Clinical Instructor in Surgery (Otolaryngology)*
B.S. 1958, M.S. 1959, M.D. 1963, George Washington University

James Burton Moe, *Adjunct Assistant Professor of Pathology*
B.S. 1962, D.V.M. 1964, University of Minnesota, Ph.D. 1975, University of California, Davis

Robert Joseph Mohrbacher, *Lecturer in Medical Technology in Pathology*
B.S. 1974, George Washington University

Andrew Bernard Molchon, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1963, Yale University; M.D. 1967, Tufts University

Gaetano Francis Molinari, *Professor of Neurology; Chairman of the Department of Neurology*
B.S. 1957, College of the Holy Cross; M.D. 1961, New Jersey College of Medicine and Dentistry

William Patrick Monaghan, *Assistant Professorial Lecturer in Pathology*
B.S. 1968, Old Dominion University; M.S. 1973, Ph.D. 1975, Bowling Green State University

Allen Mendel Mondzac, *Associate Clinical Professor of Medicine*
B.A. 1958, M.D. 1961, George Washington University

Marvin Mones, *Special Lecturer in Child Health and Development*
B.S. 1940, Villanova University; M.D. 1947, Johns Hopkins University

Richard J. Montali, *Adjunct Associate Professor of Pathology (Comparative Pathology)*
D.V.M. 1964, Cornell University

Terry William Moody, *Assistant Professor of Biochemistry*
B.S. 1972, California Institute of Technology; Ph.D. 1978, University of California, Berkeley

George Albert Morales, *Professor of Anesthesiology and of Neurological Surgery*
B.S. 1947, M.D. 1951, University of Mexico

Judith F. Morales, *Assistant Clinical Professor of Neurology and of Child Health and Development*
M.D. 1966, National University of Cordoba, Argentina

James Michael Morris, *Adjunct Instructor in Health Care Sciences*

Robert Warren Morris, *Clinical Instructor in Health Care Sciences*
B.S. 1971, Old Dominion University; B.S. 1976, George Washington University

Ruth Ellen Morsch, *Adjunct Instructor in Health Care Sciences*
B.S. 1977, George Washington University

Paul David Morte, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1966, Georgetown University; D.O. 1974, Philadelphia College of Osteopathic Medicine

E. Gnanaraj Moses, *Special Lecturer in Child Health and Development*
B.B.A. 1951, Spicer Memorial College, India; M.A. 1963, Howard University; Ph.D. 1968, University of Maryland

Don Thurston Mosher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1953, M.D. 1956, University of Kansas

Herbert Alan Moskovitz, *Associate Clinical Professor of Medicine*
B.S. 1949, Georgia Institute of Technology; M.D. 1954, Emory University

Peter Alan Moskovitz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1965, Haverford College; M.D. 1969, Columbia University

Nasser Movassaghi, *Professor of Child Health and Development*
Natural Science 1950, Rahnema College, Iran; M.D. 1956, University of Tehran, Iran

Virginia Ann Moyer, *Clinical Instructor in Child Health and Development*
B.A. 1974, Rice University; M.D. 1977, Baylor University

Richard Arthur Muesing, *Assistant Research Professor of Medicine and of Biochemistry*
B.S. 1960, Mankato State College; M.S. 1964, Ph.D. 1969, University of Illinois

Fitzhugh Mullan, *Adjunct Associate Professor of Health Care Sciences*
B.A. 1964, Harvard University; M.D. 1968, University of Chicago

Myron Irwin Murdock, *Clinical Instructor in Urology*
B.A. 1964, Boston University; M.D. 1968, George Washington University

James Peter Murphy, *Associate Clinical Professor of Neurological Surgery*
B.S. 1935, College of St. Thomas; M.D. 1939, Yale University

Michael Owen Murphy, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1959, St. Ambrose College; M.D. 1963, Marquette University

Thomas Miles Murphy, *Assistant Professor of Child Health and Development*
A.B. 1969, Harvard University; M.D. 1973, University of Rochester

Francis James Murray, *Clinical Professor of Medicine*
B.S. 1936, University of Notre Dame; M.D. 1940, Cornell University

John Lee Murray, *Clinical Instructor in Radiology*
B.S. 1964, Bowling Green State University; M.S. 1973, California State University, San Diego

Sharon Lee Murray, *Assistant Professor of Child Health and Development and of Speech-Language Pathology*
B.A. 1963, University of Oregon; M.A. 1969, University of Kentucky; Ph.D. 1972, University of Kansas

Challakonda N. Murty, *Associate Research Professor of Pathology*
B.S. 1960, Andhra University, India; M.S. 1962, Ph.D. 1965, Banaras Hindu University, India; Ph.D. 1969, University of Sydney, Australia

Ntinos C. Myrianthopoulos, *Associate Clinical Professor of Neurology*
B.S. 1952, George Washington University; M.S. 1954, Ph.D. 1957, University of Minnesota

Carmen Marie Myrie, *Assistant Professor of Dermatology and of Pathology*
B.A. 1969, Manhattanville College; M.D. 1974, New York University

Peter John Nachajski, *Assistant Clinical Professor of Child Health and Development*
A.B. 1956, Brown University; M.D. 1960, George Washington University

Gurbux Hariram Nachnani, *Clinical Professor of Medicine*
M.B., B.S. 1963, University of Poona, India

Steven Brooks Nagelberg, *Assistant Clinical Professor of Health Care Sciences*
M.D. 1978, Columbia University

Meenakshi Arvin Nandedkar, *Assistant Clinical Professor of Pathology*
M.D. 1964, Nagpur University, India

Stephen Sanborn Nason, *Associate Professor of Orthopaedic Surgery and of Child Health and Development*
M.D. 1967, Tulane University

Thomas John Nassif, *Associate Professor of Anesthesiology*
B.A. 1958, West Virginia University; M.D. 1962, University of Pennsylvania

Cheryl Marco Naulty, *Assistant Professor of Child Health and Development*
B.A. 1968, University of Pennsylvania; M.D. 1972, Thomas Jefferson University

Esfand Steven Nawab, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1961, Dr.Med. 1963, University of Dusseldorf, West Germany

Paul Henry Naylor, *Assistant Research Professor of Biochemistry*
B.S. 1970, Washington College; M.A. 1972, Johns Hopkins University; Ph.D. 1977, University of Texas Medical Branch at Galveston

J. Michael Neander, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1972, University of Rochester; M.D. 1976, State University of New York at Buffalo

Keith Henderson Neblett, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1970, Howard University

Norton Herbert Neff, *Professorial Lecturer in Pharmacology*
B.S. 1958, M.S. 1960, Ph.D. 1964, Philadelphia College of Pharmacy and Science

Andris Neimanis, *Assistant Clinical Professor of Dermatology*
A.B. 1958, Harvard University; M.D. 1963, University of Rochester

Gilbert Richard Nelmes, *Adjunct Assistant Professor of Health Care Sciences*

Bertel Nelson, *Clinical Professor of Medicine*
A.B. 1945, M.D. 1948, George Washington University

Karin Becker Nelson, *Associate Clinical Professor of Neurology and of Child Health and Development*
M.D. 1957, University of Chicago

Massoud Nemati, *Clinical Instructor in Medicine*
M.D. 1968, University of Tehran, Iran

Robert Jon Neviaser, *Professor of Orthopaedic Surgery*
A.B. 1958, Princeton University; M.D. 1962, Thomas Jefferson University

Thomas Jay Neviaser, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1962, University of Pennsylvania; M.D. 1966, George Washington University

Michael Arthur Newman, *Associate Clinical Professor of Medicine*
B.A. 1963, Stanford University; M.D. 1969, University of Rochester

Richard S. Newman, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1974, Tufts University; M.D. 1978, George Washington University

Lorenz K. Ng, *Assistant Clinical Professor of Neurology*
A.B. 1961, Stanford University; M.D. 1965, Columbia University

Richard Austin Nicklas, *Assistant Clinical Professor of Medicine*
B.A. 1958, Cornell University; M.D. 1964, George Washington University

Judith Halsey Nicklason, *Adjunct Assistant Professor of Health Care Sciences*

Honorato F. Nicodemus, *Associate Clinical Professor of Anesthesiology*
M.D. 1962, Far Eastern University, Philippines

Thomas Peter Nigra, *Clinical Professor of Dermatology*
B.A. 1963, St. Vincent College; M.D. 1967, University of Pennsylvania

Allen Abbe Nimetz, *Assistant Clinical Professor of Medicine*
B.A. 1964, M.D. 1968, Cornell University

Raymon Augusta Noble, *Assistant Clinical Professor of Medicine*
B.S. 1962, Iowa Wesleyan College, M.D. 1966, University of Missouri

Thomas Douglas Noble, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1924, M.B. 1927, M.D. 1936, University of Toronto, Canada

Lucien Edward Nochomovitz, *Assistant Professor of Pathology*
M.B., Ch.B. 1970, M.Med. 1975, University of Cape Town, South Africa

Joseph Anthony Noronha, *Clinical Instructor in Health Care Sciences*
M.D. 1966, Mysore Medical College, India

Richard Howard Norton, *Adjunct Associate Professor of Anesthesiology*
A.B. 1954, M.D. 1958, University of Pennsylvania

Kenneth Gerard Norwood, *Special Lecturer in Radiology*

Joseph Dove Noshpitz, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1943, M.D. 1945, University of Louisville

Robert Allen Nover, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1961, Union College, New York; M.D. 1965, State University of New York Upstate Medical Center

Judith Ann Nowak, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, M.D. 1974, Cornell University

John Francis Nowell, *Clinical Instructor in Ophthalmology*
B.S. 1954, M.D. 1956, University of Maryland

James C. Noyes, *Clinical Instructor in Health Care Sciences*
B.S. 1977, George Washington University

William Lemot Nyland, *Adjunct Instructor in Health Care Sciences*

Emmanuel O. Obele, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1974, Howard University; M.D. 1977, Yeshiva University

James William Oberman, *Associate Professor of Child Health and Development*
M.D. 1949, Georgetown University

Allen Albert Oboler, *Assistant Clinical Professor of Medicine*
M.D. 1966, Wayne State University

Daniel Warne Ochsenschlager, *Associate Professor of Child Health and Development*
B.S. 1964, Beloit College; M.D. 1968, Marquette University

Joseph M. Brian O'Connell, *Associate Professor of Medicine*
M.B., B.Ch., B.A.O. 1957, University College, Ireland

John Joseph O'Connor, *Assistant Clinical Professor of Surgery*
B.A. 1962, M.D. 1966, State University of New York at Buffalo

Daniel Joseph O'Donnell, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1975, University of Pittsburgh

Gerard Joseph O'Dowd, *Instructor in Pathology*
B.S. 1972, M.D. 1977, Georgetown University

Norman A. Odyniec, *Assistant Clinical Professor of Surgery*
B.S. 1959, University of Notre Dame; M.D. 1963, Georgetown University

Yolanda Castillo Oertel, *Associate Professor of Pathology*
M.D. 1965, University of Peru

Tae Hee Oh, *Associate Professor of Anesthesiology and of Child Health and Development*
M.D. 1964, Seoul National University, South Korea

Delia Iglauer O'Hara, *Adjunct Instructor in Health Care Sciences*
B.S. 1965, Simmons College

Donald Ary O'Kieffe, *Associate Clinical Professor of Medicine*
B.A. 1960, M.D. 1964, Yale University

Andres Olaciregui, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1958, Biffi-LaSalle University, Colombia; M.D. 1966, Javeriana University, Colombia

Roger J. Oldham, *Special Lecturer in Surgery*
B.S. 1965, Ball State University; M.D. 1969, University of Indiana

Dennis Sophian O'Leary, *Professor of Medicine; Dean of the Medical Center, for Clinical Affairs*
B.A. 1960, Harvard University; M.D. 1964, Cornell University

Mary Ellen Phillips Oliveri, *Associate Research Professor of Psychiatry and Behavioral Sciences (Psychology)*
A.B. 1971, Trinity College, District of Columbia; M.A. 1973, Ph.D. 1975, Johns Hopkins University

William Wells Olmsted, *Professor of Radiology*
B.A. 1963, Williams College; M.D. 1968, University of Rochester; M.S. 1972, University of California, Los Angeles

Bennett Olshaker, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1943, M.D. 1945, George Washington University

Ayub Khan Ommaya, *Clinical Professor of Neurological Surgery*
M.D. 1953, King Edward Medical College; M.A. 1960, Oxford University, England

John Francis O'Neill, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1952, Mount St. Mary's College, Maryland; M.D. 1956, Georgetown University

Beale Hibbs Ong, *Associate Clinical Professor of Child Health and Development*
B.A. 1955, M.D. 1959, George Washington University

Olugbenga Soga Oredein, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1970, Alma College; M.D. 1974, Howard University

Jan Marc Orenstein, *Associate Professor of Pathology*
B.A. 1963, Johns Hopkins University; Ph.D. 1969, M.D. 1971, State University of New York Downstate Medical Center

Steven Oristian, *Clinical Instructor in Surgery*
B.S. 1947, Mount St. Mary's College, Maryland; M.D. 1951, Georgetown University

Ronald Julian Orleans, *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1965, Franklin and Marshall College; M.D. 1969, George Washington University

George M. Orr, *Assistant Clinical Professor of Medicine*
B.S. 1971, M.D. 1975, University of Pittsburgh

Louis G. Ortega, *Associate Professor of Pathology*
M.D. 1946, New York Medical College

Mario R. Ortega, *Assistant Clinical Professor of Child Health and Development*
M.D. 1965, University of San Carlos, Guatemala

Helmuth F. Orthner, *Associate Professor of Clinical Engineering*
Dipl. Ing. 1966, Technical University of Munich, West Germany; Ph.D. 1973, University of Pennsylvania

Morris A. Osborn, *Assistant Clinical Professor of Neurology*
M.D. 1963, University of Miami

Raphael Joseph Osheroff, *Assistant Clinical Professor of Medicine*
B.A. 1959, Columbia University; M.D. 1963, Creighton University

Bernard Howard Ostrow, *Assistant Clinical Professor of Medicine*
B.A. 1944, Miami University; M.D. 1948, George Washington University

John Edward Ott, *Professor of Health Care Sciences, of Child Health and Development, and of Health Services Administration; Chairman of the Department of Health Care Sciences*
B.S. 1959, M.D. 1963, University of Pittsburgh

Ronald Ottenberg, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1956, M.D. 1959, George Washington University

Leslie William Ouderkirk, *Special Lecturer in Pathology*
B.A. 1975, Chadron State College

Bernard James Owens, *Adjunct Associate Professor of Health Care Sciences*
B.S. 1968, Fordham University; M.D. 1972, State University of New York Downstate Medical Center

Kathleen Leinau Owens, *Clinical Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1954, M.A. 1962, University of California, Berkeley; M.S.W. 1969, Howard University

Mark Norman Ozer, *Associate Research Professor of Child Health and Development*
A.B. 1953, Harvard University; M.D. 1957, Boston University

James Ronald Pace, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1976, University of Nebraska

Russel Smith Page, Jr., *Clinical Professor of Surgery (Otolaryngology)*
A.B. 1936, Dartmouth College; M.D. 1940, University of Vermont

Chang Hum Paik, *Associate Research Professor of Radiology (Nuclear Medicine)*
B.S. 1963, Inha Institute of Technology, South Korea; Ph.D. 1972, University of California, Santa Cruz

Rebecca Ann Painter, *Adjunct Instructor in Health Care Sciences*

Richard Emery Palmer, *Clinical Professor of Pathology*
A.B., M.D. 1944, George Washington University

Richard Roy Palmer, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1966, Harvard University; M.D. 1971, Georgetown University

Joseph John Palombi, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1962, Union College, New York; M.D. 1968, Albany Medical College of Union University

Stanley Robert Palombo, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1955, Harvard University; M.D. 1960, Columbia University

Garsutis Kazimieras Palys, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1969, St. John's University; M.D. 1973, State University of New York at Buffalo

John C. Pan, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1960, University of Notre Dame; M.D. 1970, George Washington University

Stephen Stavros Pappas, *Assistant Clinical Professor of Ophthalmology*
B.S. 1952, M.D. 1956, George Washington University

Soo Woong Park, *Assistant Clinical Professor of Medicine*
M.D. 1969, Seoul National University, South Korea

Edwin Pearson Parker III, *Clinical Professor of Medicine*
B.S. 1939, M.D. 1942, University of Virginia

Matthew Allen Parker, *Assistant Clinical Professor of Medicine*
B.A. 1971, University of Rochester; M.D. 1975, New York Medical College

Dee Rich Parkinson, *Associate Clinical Professor of Pathology*
M.D. 1943, George Washington University

Marshall Miller Parks, *Clinical Professor of Ophthalmology and of Child Health and Development*
A.B. 1939, Illinois College; M.D. 1943, St. Louis University

Harry Leslie Parlette III, *Special Lecturer in Health Care Sciences*
B.S. 1964, Washington and Lee University; M.D. 1968, Georgetown University

Alvin Edward Parrish, *Professor of Medicine*
M.D. 1945, George Washington University

Robert Harold Parrott, *Professor of Child Health and Development; Chairman of the Department of Child Health and Development*
M.D. 1949, Georgetown University

Diane Brickley Parsons, *Associate Research Professor of Orthopaedic Surgery and of Anatomy*
A.B. 1967, Newton College; Ph.D. 1972, Boston University

Michael Allen Paske, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1972, Baker University

Dinesh D. Patel, *Adjunct Assistant Professor of Health Care Sciences*
M.B., B.S. 1962, University of Bombay, India; M.D. 1965, Gujarat University, India

Rameschandra I. Patel, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1975, University of Baruda, India

Joseph Paul Paternite, *Adjunct Instructor in Health Care Sciences*

Bentley Lorene Patterson, *Clinical Instructor in Dermatology*
B.S. 1970, Spelman College; M.D. 1974, Harvard University

Kathleen Patterson, *Assistant Professor of Pathology and of Child Health and Development*
B.S. 1973, Iowa State University; M.D. 1976, University of Iowa

Robert Harry Patterson, *Assistant Professor of Pathology*
B.A. 1965, Bridgewater College; M.D. 1969, George Washington University

John Douglas Paulson, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1968, M.D. 1971, University of Virginia

Leonard Gregory Pawlson, *Associate Professor of Health Care Sciences, of Medicine, and of Health Services Administration*
B.S. 1965, Pennsylvania State University; M.D. 1969, University of Pittsburgh; M.P.H. 1976, University of Washington

Beneta Jane Peacock, *Assistant Professor of Child Health and Development*
B.A. 1946, Mary Baldwin College; M.D. 1965, New York University

Jed Williams Pearson, Jr., *Clinical Professor of Obstetrics and Gynecology*
A.B. 1934, DePauw University; M.D. 1938, Indiana University

Charles Albert Peck, Jr., *Assistant Professor of Surgery*
B.S. 1961, Ohio University; M.D. 1965, University of Cincinnati

Frank Alan Pedreira, *Associate Clinical Professor of Child Health and Development*
A.B. 1959, Rutgers—The State University; M.D. 1963, State University of New York Upstate Medical Center

Paul Thomas Peebles, *Associate Clinical Professor of Child Health and Development*
B.S. 1963, John Carroll University; M.D. 1967, Case Western Reserve University

Roger Peele, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1955, University of North Carolina; M.D. 1960, University of Tennessee

Walter Reams Perkins, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1957, University of Richmond; M.D. 1961, Medical College of Virginia of Virginia Commonwealth University

Seymour Perlin, *Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, Princeton University; M.D. 1950, Columbia University

Gerald Paul Perman, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.S. 1971, B.S. 1972, M.D. 1977, University of Maryland

Louis Edward Perraut, *Clinical Instructor in Ophthalmology*
A.B. 1945, University of Kentucky; M.D. 1946, University of Louisville

Lowell Wesley Perry, *Professor of Child Health and Development*
B.S. 1956, Albright College; M.D. 1960, Temple University

Kenna Dale Peusner, *Assistant Professor of Anatomy*
B.S. 1968, Simmons College; Ph.D. 1974, Harvard University

David Lewis Pfeifer, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1963, University of Dayton; D.D.S. 1966, Indiana University; M.S. in Sp.Std. 1973, George Washington University

Alummootil Mathew Philip, *Clinical Instructor in Surgery*
M.B., B.S. 1959, University of Kerala, India; F.R.C.S. 1966, Royal College of Surgeons, Scotland

Michael M. Phillips, *Assistant Clinical Professor of Medicine*
B.A. 1962, City University of New York, Brooklyn College; M.D. 1967, State University of New York at Buffalo

Terence Martyn Phillips, *Associate Professor of Medicine*
M.I.Biol. 1973, A.R.I.C. 1974, M.Phil. 1975, Ph.D. 1977, London University

Christopher Erskine Pickwick, *Adjunct Assistant Professor of Radiology*
B.S. in B.A. 1965, Clark University; M.B.A. 1976, Suffolk University

Thomas Eugene Piemme, *Professor of Health Care Sciences and of Medicine; Assistant Dean for Continuing Medical Education*
B.S. 1954, M.D. 1958, University of Pittsburgh

Lawrence E. Pierce, *Professor of Medicine*
M.D. 1955, Georgetown University

Leslie Harrell Pierce, Jr., *Assistant Professor of Medicine*
A.B. 1965, Williams College; M.D. 1969, University of Maryland

Roger James Pierce, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1964, George Washington University; M.D. 1968, Georgetown University

Howard Clemeth Pierpont, *Associate Professor of Surgery*
A.B. 1939, Marietta College; M.D., C.M. 1943, McGill University, Canada

Dean Lawrence Pierson, *Assistant Clinical Professor of Dermatology*
B.S. 1962, M.P.H. 1963, University of California, Berkeley; M.D. 1967, Temple University

Peter Charles Pieslor, *Clinical Instructor in Pathology*
B.S. 1970, Villanova University; M.D. 1974, College of Medicine and Dentistry of New Jersey

Lynde Harrison Pillsbury, *Clinical Instructor in Child Health and Development*
B.A. 1965, Yale University; J.D. 1970, George Washington University; M.D. 1977, Georgetown University

Harold Alan Pincus, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, University of Pennsylvania; M.D. 1975, Yeshiva University

Esther Anita Garner Pinder, *Assistant Clinical Professor of Child Health and Development*
B.S. 1965, City University of New York, City College; M.D. 1969, Howard University

Sidney Jeffrey Pion, *Assistant Clinical Professor of Radiology*
B.S. 1963, City University of New York, City College; M.D. 1969, Yeshiva University

Hanna Zulauf Pipberger, *Assistant Research Professor of Clinical Engineering*
B.A. 1942, Teachers College, Chur, Switzerland

Joseph Michael Pisani, *Associate Clinical Professor of Medicine*
A.B. 1938, Fordham University; M.D. 1942, New York University

Elizabeth Moore Plionis, *Assistant Research Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, College of St. Catherine; M.S.W. 1968, University of Minnesota; D.S.W. 1976, University of Maryland

Murray Michael Pollack, *Assistant Professor of Anesthesiology and of Child Health and Development*
A.B. 1970, University of Rochester; M.D. 1974, Yeshiva University

David Pope, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.B., Ch.B. 1957, St. Andrews University, Scotland

Valery Alexander Portnoi, *Associate Professor of Health Care Sciences and of Medicine*
M.D. 1962, Medical Institute of Kuban, U.S.S.R.

Jerrold Morton Post, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, M.D. 1960, Yale University

Phillip William Poth, *Assistant Clinical Professor of Medicine*
B.S. 1968, Texas A&M University; M.D. 1972, Tulane University

Barry M. Potter, *Associate Professor of Radiology and of Child Health and Development*
B.A. 1963, City University of New York, Brooklyn College; M.D. 1967, State University of New York Downstate Medical Center

Gail Judith Povar, *Assistant Professor of Health Care Sciences and of Medicine; Faculty Associate for Humanities and Medicine, Division of Experimental Programs*
B.A. 1972, Cornell University; M.P.H. 1977, University of Michigan; M.D. 1977, University of Vermont

Jeffrey Peter Powell, *Adjunct Associate Professor of Health Care Sciences*
A.B., B.S. 1966, Canisius College; D.D.S. 1971, M.D. 1974, State University of New York at Buffalo

Velma E. Latmore Powell, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1972, Howard University; M.D. 1976, State University of New York Downstate Medical Center

Virginia Elizabeth Powell, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1949, Goucher College; M.D. 1953, Harvard University

Daniel Powers, *Special Lecturer in Surgery*
A.B. 1952, Syracuse University; M.D. 1956, Boston University

David Neil Powers, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1973, Dartmouth College; M.D. 1977, University of Pennsylvania

Neel Jack Price, *Clinical Professor of Obstetrics and Gynecology*
A.B. 1939, B.S. 1940, M.D. 1942, University of Oklahoma

Aron Primack, *Assistant Clinical Professor of Medicine*
B.S. 1963, M.D. 1967, Northwestern University

Leon Prosky, *Adjunct Professor of Biochemistry*
B.S. 1954, City University of New York, Brooklyn College; M.S. 1955, Ph.D. 1958, Rutgers—The State University

Stephen D. Protos, *Special Lecturer in Surgery*
M.D. 1951, Wagner College; M.A. 1951, Ph.D. 1953, M.D. 1957, George Washington University

Louis Quain Pugsley, *Associate Clinical Professor of Obstetrics and Gynecology*
A.B. 1954, Hamilton College; M.D. 1958, Cornell University

Robert Earl Pumphrey, Jr., *Clinical Professor of Surgery (Otolaryngology)*
B.S. 1955, Denison University; M.D. 1959, Ohio State University

Frank Brian Purvis, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1973, Central Methodist College; M.D. 1977, University of Missouri

Jerome Stuart Putnam, *Associate Clinical Professor of Medicine*
A.B. 1965, Dartmouth College; M.D. 1969, Tufts University

Robert Sheridan Pyatt, Jr., *Assistant Clinical Professor of Radiology*
B.S. 1971, University of Massachusetts; M.D. 1975, State University of New York Downstate Medical Center

James Tindal Quattlebaum, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, University of South Carolina; M.D. 1956, Medical College of South Carolina; M.A. 1961, Columbia University

Alan Saul Rabson, *Professorial Lecturer in Pathology*
B.A. 1948, University of Rochester; M.D. 1950, State University of New York Downstate Medical Center

Luis Carlos Radice, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1957, University of Buenos Aires, Argentina

Jack Raher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1943, Vanderbilt University; M.S. 1948, University of Cincinnati; M.D. 1953, University of Geneva, Switzerland

Thomas Gilman Rainey, *Assistant Clinical Professor of Anesthesiology*
A.B. 1970, M.D. 1974, Duke University

Rasjit Chowdhary Rajagopal, *Clinical Instructor in Obstetrics and Gynecology*
M.B., B.S., D.G.O. 1975, University of Madras, India

Devanhalli Ramaswamy, *Assistant Clinical Professor of Medicine*
M.D. 1961, University of Mysore, India

James North Ramey, *Assistant Clinical Professor of Medicine*
B.A. 1964, Amherst College; M.D. 1968, Columbia University

Judson Graves Randolph, *Professor of Surgery and of Child Health and Development*
B.A. 1950, M.D. 1953, Vanderbilt University

Joseph Eugene Rankin, *Professor of Psychiatry and Behavioral Sciences*
B.S. 1942, Catholic University of America; M.D. 1946, George Washington University

Judith Livant Rapoport, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1955, Swarthmore College; M.D. 1959, Harvard University

Philip Rentz Rast, *Adjunct Associate Professor of Health Care Sciences*
A.B. 1971, University of North Carolina; M.D. 1975, Medical College of Georgia

Harold Elton Ratcliffe, *Professor of Medicine*
B.A. 1935, M.D. 1939, Tulane University

Richard Albert Ratner, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, University of Chicago; M.D. 1966, University of Pennsylvania

Robert Edward Ratner, *Assistant Professor of Medicine (Endocrinology)*
B.S. 1974, Tufts University; M.D. 1977, Baylor University

Pawah K. Rattan, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.B., B.S. 1972, Amritjar Medical College, India

Kent Ravenscroft, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Yale University; M.D. 1966, Harvard University

Sheila Eileen Hamburg Raviv, *Assistant Professional Lecturer in Health Care Sciences*
B.A. 1964, Indiana University

James Lamar Read, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1949, M.D. 1953, University of Maryland

Gregory H. Reaman, *Associate Professor of Child Health and Development*
B.S. 1969, University of Detroit; M.D. 1973, Loyola University of Chicago

Richard Charney Reba, *Professor of Radiology (Nuclear Medicine) and of Medicine*
M.D. 1957, University of Maryland

Gary Louis Rebholz, *Adjunct Instructor in Health Care Sciences*

Barry Sterling Reed, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1967, University of Washington; M.D. 1971, George Washington University

Thomas Sargent Reese, *Professorial Lecturer in Anatomy*
B.A. 1957, Harvard University; M.D. 1962, Columbia University

Richard Brian Reff, *Assistant Professor of Orthopaedic Surgery and of Child Health and Development*
B.A. 1969, M.D. 1972, George Washington University

Claude Virgil Reich, *Research Professor of Microbiology*
B.S. 1953, Ph.D. 1958, Pennsylvania State University; M.S. 1954, University of Wisconsin

Joel J. Reich, *Assistant Professor of Health Care Sciences (Emergency Medicine)*
B.S. 1973, Brandeis University; M.S. 1974, Washington University; M.D. 1978, State University of New York at Buffalo

Melvin Reich, *Professor of Microbiology*
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers—The State University

Jorge Horacio Reisin, *Clinical Instructor in Surgery*
B.A. 1954, Colegio Nacional Mariano Moreno, Argentina; M.D. 1962, Buenos Aires School of Medicine, Argentina

David Reiss, *Professor of Psychiatry and Behavioral Sciences and of Medicine*
A.B. 1958, M.D. 1962, Harvard University

William Gregory Reisz, *Assistant Professor of Health Care Sciences*
B.S. 1972, Towson State College

Clarence Arnold Renschler, *Assistant Clinical Professor of Child Health and Development*
B.A. 1964, Walla Walla College; M.D. 1968, Loma Linda University

Philip Louis Repetto, Jr., *Associate Clinical Professor of Dermatology*
B.A. 1951, M.D. 1955, University of Pennsylvania

Harvey L. P. Resnik, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, State University of New York at Buffalo; M.D. 1955, Columbia University

Vera Ruth Reublinger, *Adjunct Instructor in Health Care Sciences*
B.S. 1978, George Washington University

Frederick Turner Reuter, *Clinical Professor of Urology*
M.D. 1944, George Washington University

Walter Albert Rey, *Lecturer in Pathology*
B.S. 1975, University of North Dakota

Richard Coleman Rhame, *Assistant Clinical Professor of Urology*
A.B. 1950, Princeton University; M.D. 1954, George Washington University

Jack Jacob Rheingold, *Clinical Professor of Medicine*
B.A. 1936, University of Alabama; M.B. 1940, M.D. 1941, University of Cincinnati

Harvey William Rice, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, West Virginia Wesleyan College; M.D. 1959, University of Cincinnati

Jeffrey I. Rich, *Assistant Clinical Professor of Radiology*
B.A. 1970, Case Western Reserve University; M.D. 1974, State University of New York, Downstate Medical Center

Allen Lee Richards, *Special Lecturer in Pathology*
B.A. 1977, University of South Florida

Tarpley Mann Richards, *Assistant Research Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, Tulane University; M.A. 1972, University of Maryland; M.S.W. 1977, Catholic University of America

Sanford Norman Richman, *Assistant Clinical Professor of Medicine*
B.S. 1960, University of Georgia; M.D. 1964, Medical College of Georgia

Ruth Stone Richmond, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1937, Goucher College; M.S.W. 1969, Catholic University of America

Kenneth C. Rickler, *Assistant Clinical Professor of Neurology and of Psychiatry and Behavioral Sciences*
B.A. 1968, Cornell University; M.D. 1972, State University of New York at Buffalo

Patrick Joseph Riddle, *Assistant Professor of Ophthalmology*
M.D. 1971, Creighton University

Stanley E. Ridley, *Clinical Instructor in Child Health and Development and in Psychiatry and Behavioral Sciences*
B.A. 1972, Dominican College; M.S. 1977, Ph.D. 1981, Howard University

Richard Kenneth Riegelman, *Associate Professor of Health Care Sciences and of Medicine*
M.D. 1973, University of Wisconsin; M.P.H. 1975, Ph.D. 1982, Johns Hopkins University

Rebecca Eisenberg Rieger, *Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1940, City University of New York, Hunter College; M.A. 1941, Columbia University; M.A. 1952, Ph.D. 1960, Catholic University of America

Carol Jean Riendeau, *Lecturer in Medical Technology in Pathology*
B.S. 1972, Indiana University, Pennsylvania

Kenneth Gerard Rieth, *Associate Professor of Radiology*
B.S. 1969, Boston College; M.D. 1973, St. Louis University

Monira K. Rifaat, *Assistant Clinical Professor of Pathology*
M.B., Ch.B. 1961, Alexandria University, Egypt; M.A. 1964, Boston University

Jorge Carlos Rios, *Eugene Meyer Professor of Medicine; Chairman of the Department of Medicine*
M.D. 1959, University of Buenos Aires, Argentina

Robert Sheldon Rixse, *Assistant Clinical Professor of Child Health and Development*
B.A. 1967, Johns Hopkins University; M.D. 1972, Duke University

Hugo Victor Rizzoli, *Professor of Neurological Surgery; Chairman of the Department of Neurological Surgery*
A.B. 1936, M.D. 1940, Johns Hopkins University

John William R-Love, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, M.D. 1964, Emory University

Herbert Ray Roberts, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1970, U.S. Military Academy; M.D. 1976, University of Missouri

William Clifford Roberts, *Professorial Lecturer in Medicine and in Pathology (Cardiology)*
A.B. 1954, Southern Methodist University; M.D. 1958, Emory University

Alfred Godfrey Robichaux III, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1974, Spring Hill College; M.D. 1978, Louisiana State University

Carolyn Bauer Robinowitz, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1959, Wellesley College; M.D. 1964, Washington University

Albert Irving Robins, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1937, George Washington University; M.D. 1941, Georgetown University

Douglas Neil Robins, *Assistant Clinical Professor of Dermatology, of Medicine, and of Child Health and Development*
B.S. 1965, Washington and Lee University; M.D. 1969, George Washington University

Joseph Daniel Robinson, *Assistant Clinical Professor of Medicine*
A.B. 1965, Princeton University; M.D. 1970, Yale University

Luther Dabney Robinson, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1943, Virginia State College; M.D. 1946, Meharry Medical College

Mary Evans Robinson, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1951, Mary Baldwin College; M.S. 1953, George Washington University; Ph.D. 1959, Purdue University

Richard G. Robinson, *Assistant Professor of Medicine*
A.B. 1971, Oberlin College; M.D. 1975, Cornell University

Bruce Robert Rock, *Adjunct Instructor in Radiology*

S. David Rockoff, *Professor of Radiology*
A.B. 1951, Syracuse University; M.D. 1955, Albany Medical College of Union University; M.S. 1961, University of Pennsylvania

Harold Irvin Rodman, *Clinical Instructor in Ophthalmology*
B.A. 1952, Johns Hopkins University; M.D. 1956, University of Maryland

Orlando Gilbert Rodman, *Associate Clinical Professor of Dermatology*
B.A. 1961, Valparaiso University; M.D. 1965, Howard University

Chalon Rodriguez, *Associate Clinical Professor of Urology*
M.D. 1943, Havana University, Cuba

Eric Gibson Rodriguez, *Instructor in Medicine*
B.A. 1969, M.D. 1979, George Washington University; M.P.H. 1973, Yale University

William Julio Rodriguez, *Associate Professor of Child Health and Development*
B.S. 1963, M.D. 1967, Ph.D. 1975, Georgetown University

Carl M. Rogers, *Assistant Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1972, Park College; M.A. 1974, Ph.D. 1977, George Peabody College for Teachers

Charles Clanton Rogers, *Professor of Radiology (Radiation Therapy) and of Obstetrics and Gynecology*
B.A. 1956, Maryville College, Tennessee; M.D. 1960, University of Arkansas

Richard Allan Rogers, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1941, University of Washington; M.D. 1944, Northwestern University

Nirupma Butail Rohatgi, *Assistant Clinical Professor of Medicine (Allergy)*
M.B., B.S. 1971, All India Institute of Medical Sciences

Prashant Kumar Rohatgi, *Assistant Professor of Medicine*
M.B., B.S. 1969, All India Institute of Medical Sciences

Monroe James Romansky, *Professor of Medicine*
A.B. 1933, University of Maine; M.D. 1937, University of Rochester

Nancy Josette Ronsheim, *Clinical Instructor in Ophthalmology*
B.S. 1964, M.D. 1971, Cornell University; M.A.T. 1965, Harvard University

Morton Harold Rose, *Assistant Clinical Professor of Medicine*
M.D. 1942, George Washington University

Leonard Asher Rosen, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, M.D. 1976, George Washington University

Arthur Bernard Rosenbaum, *Clinical Professor of Medicine and of Health Care Sciences*
B.S. 1931, City University of New York, City College; M.D. 1935, New York University

Kenneth Neil Rosenbaum, *Associate Professor of Child Health and Development*
B.S. 1968, M.D. 1971, University of Louisville

Meyer Rosenbaum, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1942, M.D. 1944, Tulane University

Joel Rosenberg, *Assistant Clinical Professor of Medicine*
B.A. 1969, Washington University; M.D. 1973, Tulane University

Steven Aaron Rosenberg, *Associate Professor of Surgery*
B.A. 1960, M.D. 1963, Johns Hopkins University; Ph.D. 1968, Harvard University

Stephen Rosenblum, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Amherst College; M.D. 1967, Columbia University

Glenn Carl Rosenquist, *Professor of Child Health and Development*
B.A. 1953, M.D. 1957, University of Nebraska

Jeffrey Mark Rosenstein, *Assistant Professor of Anatomy*
B.A. 1971, Kent State University; Ph.D. 1976, Pennsylvania State University

Marvin Rosenstein, *Assistant Clinical Professor of Radiology (Radiation Physics)*
B.S. 1961, Ph.D. 1971, University of Maryland; M.S. 1966, Rensselaer Polytechnic Institute

Robert Edward Rosenthal, *Assistant Professor of Health Care Sciences (Emergency Medicine)*
B.A. 1925, Yale University; M.D. 1929, New York University

Douglas Roy Rosing, *Associate Clinical Professor of Medicine*
A.B. 1963, Princeton University; M.D. 1967, State University of New York at Buffalo

Allan Michael Ross, *Professor of Medicine*
B.A. 1960, Northwestern University; M.D. 1964, University of Health Sciences/Chicago Medical School

George Robert Ross, *Adjunct Associate Professor of Health Care Sciences*
D.D.S. 1964, University of Detroit; M.S. 1973, George Washington University

Michael A. Ross, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1971, Dickinson College; M.D. 1975, George Washington University

Sydney Ross, *Clinical Professor of Child Health and Development*
B.S. 1940, M.D. 1943, Harvard University

Russell Reed Rothenberg, *Assistant Clinical Professor of Medicine*
B.A. 1971, State University of New York at Binghamton; M.D. 1977, Albany Medical College

Barry Stephen Rothman, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1971, M.D. 1975, George Washington University

Gerald Rothman, *Clinical Instructor in Surgery (Oral Surgery)*
B.A. 1966, D.D.S. 1971, Temple University

Stanley Roy Rothschild, *Assistant Clinical Professor of Orthopaedic Surgery*
B.S. 1964, City University of New York, Queens College; M.D. 1968, State University of New York Upstate Medical Center

Alberto Rotsztain, *Assistant Clinical Professor of Medicine*
M.D. 1963, University of Buenos Aires, Argentina

Irwin Winn Rovner, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, M.D. 1953, University of Iowa

Donald Hooge Rowell, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1972, M.D. 1974, University of Alabama

Norman Hartley Rubenstein, *Assistant Clinical Professor of Medicine*
M.D. 1950, George Washington University

Bruce Edward Rubin, *Associate Clinical Professor of Radiology*
B.S. 1964, City University of New York, City College; M.D. 1968, Columbia University

Jesse Gallant Rubin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1954, Franklin and Marshall College; M.D. 1957, Yale University

Elliott Howard Rubino, *Adjunct Instructor in Health Care Sciences*
B.S. 1975, Virginia Polytechnic Institute and State University

Philip Rubovits-Seitz, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1944, University of Pennsylvania

Randi Rubovits-Seitz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1968, Washington University; M.D. 1972, University of Illinois Medical Center at Chicago

Roger Norris Ruckman, *Associate Professor of Child Health and Development*
B.A. 1966, Williams College; M.D. 1970, University of Virginia

Cesar Rudzki, *Associate Clinical Professor of Medicine*
M.D. 1961, University of Buenos Aires, Argentina; M.P.H. 1969, Johns Hopkins University

Daniel August Ruge, *Clinical Professor of Neurological Surgery*
B.A. 1939, North Central College; M.D. 1945, M.S. 1949, Ph.D. 1961, Northwestern University

Edward Jerome Ruley, *Associate Professor of Child Health and Development*
B.S. 1960, The Citadel; M.D. 1964, University of Maryland

Arthur Ruskin, *Associate Clinical Professor of Medicine*
B.S. 1932, City University of New York, City College; M.D. 1936, New York University

Simon Russi, *Clinical Professor of Pathology*
M.D. 1935, R. Universite Degli Studi Di Modena, Italy

Surendra Nath Rustgi, *Assistant Professor of Radiology*
B.S. 1968, M.S. 1970, Delhi University, India; Ph.D. 1974, State University of New York at Buffalo

Rhoda Rosenstein Ruttenberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, Syracuse University; M.D. 1977, George Washington University

Frank Michael Ryan, *Assistant Clinical Professor of Medicine*
B.S. 1970, St. Joseph's College, Pennsylvania; M.D. 1974, Pennsylvania State University

Waclaw Janusz Rzeszotarski, *Research Professor of Radiology (Nuclear Medicine)*
M.Sc. 1959, Institute of Technology, Poland; Ph.D. 1964, Polish Academy of Sciences

Joseph Aziz Sabri, *Associate Clinical Professor of Surgery (Otolaryngology)*
B.A. 1941, M.D. 1946, American University of Beirut, Lebanon

Nedzib Sacirbey, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1955, University of Zagreb, Yugoslavia

Josiah Sacks, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1951, Providence College; M.D. 1955, Tufts University

Thomas Lee Sacks, *Assistant Clinical Professor of Medicine (Hematology/Oncology)*
B.A. 1967, University of Pittsburgh; M.D. 1972, Tufts University

Harold Charles Sadin, *Associate Clinical Professor of Medicine*
A.B. 1948, Hamilton College; M.D. 1952, Albany Medical College of Union University

William James Sadlack, *Adjunct Instructor in Orthopaedic Surgery*
B.S. 1964, St. Peter's College; M.D. 1971, St. Louis University

David Sol Saffan, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1973, State University of New York at Albany; M.D. 1978, Medical College of Georgia

Julian Edwin Safran, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1972, M.D. 1975, George Washington University

Alan Robert Sager, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1964, Rutgers—The State University; M.D. 1969, Boston University

Nirmal K. Saini, *Associate Professor of Pathology*
M.B., B.S. 1957, King Edward Medical College, India

Tahir Sait, *Clinical Instructor in Child Health and Development*
M.B., B.S. 1964, Kerala University, India

Lawrence Paul Saladino, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1971, M.D. 1975, Georgetown University

Hernando Salcedo, *Assistant Clinical Professor of Urology*
B.S. 1955, University College, Colombia; M.D. 1962, Javeriana University, Colombia

Jose Rodofo Salcedo-Contreras, *Assistant Professor of Child Health and Development*
M.D. 1970, Guadalajara State University, Mexico

Alen Johannes Salerian, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1971, University of Istanbul, Turkey

Stanton Ethan Samenow, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1963, Yale University; M.A. 1964, Ph.D. 1968, University of Michigan

Patricia Carol Sandiford, *Clinical Instructor in Child Health and Development*
M.D. 1971, Howard University

Allen H. Sandler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, Yale University; M.D. 1970, New York University

Sumner Gerald Sandler, *Professorial Lecturer in Medicine*
A.B. 1957, Princeton University; M.D. 1962, New York University

Melvin Wesley Sandmeyer, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1950, M.D. 1953, George Washington University

Lawrence I. Sank, *Associate Professor of Health Care Sciences and of Psychiatry and Behavioral Sciences*
A.B. 1968, Brandeis University; M.S. 1970, Ph.D. 1972, Rutgers—The State University

David Lee Sansbury, *Associate Clinical Professor of Health Care Sciences*
B.S. 1964, M.A. 1965, Ph.D. 1969, Ohio State University

Philip Jay Santora, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1966, Le Moyne College; M.D. 1970, St. Louis University

Thomas Stone Sappington, *Clinical Professor of Medicine*
A.B. 1937, M.D. 1941, Harvard University

Rajindra Kumar Sarin, *Associate Clinical Professor of Medicine*
M.B., B.S. 1962, Panjab University, India

Robert Frank Sarlin, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1966, M.D. 1970, University of Maryland

David Satinsky, *Assistant Clinical Professor of Neurology*
B.A. 1960, M.D. 1964, University of Pennsylvania

Bertram Jacob Lyons Sauerbrunn, *Professor of Radiology (Nuclear Medicine)*
B.S. 1936, Lafayette College; M.D. 1940, Albany Medical College of Union University

Robert Clarence Saunders, *Assistant Professor of Medicine*
B.A. 1962, University of Washington; M.D. 1967, George Washington University

Sumner Alan Savitz, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1957, Massachusetts Institute of Technology; M.D. 1961, Tufts University

Raymond Scalettar, *Clinical Professor of Medicine*
B.A. 1950, Columbia University; M.D. 1954, State University of New York Downstate Medical Center

Giuseppe Scarcella, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, Bologna University, Italy

Giulio Italo Scarzella, *Clinical Instructor in Surgery*
M.D. 1960, Ein Chams University, Egypt

Geraldine Schaeffer, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, University of Pennsylvania; M.D. 1958, Medical College of Pennsylvania

Joseph Francis Schanno, *Assistant Clinical Professor of Surgery*
B.S. 1945, M.D. 1954, Georgetown University; M.S. 1950, Fordham University

Herbert Otto Scharpf, *Adjunct Associate Professor of Health Care Sciences*
D.D.S. 1956, University of Maryland; M.A. 1977, Pepperdine University

Alan Neil Schechter, *Professorial Lecturer in Biochemistry*
A.B. 1959, Cornell University; M.D. 1963, Columbia University

Geraldine Poppa Schechter, *Professor of Medicine*
A.B. 1959, Vassar College; M.D. 1963, Columbia University

Heinz Hanns Eduard Scheidemandel, *Clinical Instructor in Surgery (Otolaryngology)*
M.D. 1955, University of Erlangen, West Germany

Richard Francis Schillaci, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1957, Johns Hopkins University; M.D. 1961, University of Maryland

Paul Schlein, *Associate Clinical Professor of Medicine*
A.B. 1952, M.D. 1956, Cornell University

Steven Allan Schlosser, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, Lafayette College; M.D. 1975, Georgetown University

Thomas Edward Schmitt, *Special Lecturer in Obstetrics and Gynecology*
B.S. 1968, University of Dayton; M.D. 1972, Ohio State University

Edward Lewis Schneider, *Adjunct Professor of Biochemistry*
B.S. 1961, Rensselaer Polytechnic Institute; M.D. 1966, Boston University

Marvin Schneider, *Assistant Clinical Professor of Medicine*
B.S. 1956, George Washington University; M.D. 1960, Howard University

Charles Isaac Schneiderman, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1964, University of Michigan; M.D. 1968, George Washington University

Richard Schoenfeld, *Assistant Clinical Professor of Medicine*
B.S. 1954, University of Wisconsin; M.D. 1958, State University of New York Upstate Medical Center

James Anthony Schoettler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1953, California State University, Fresno; M.D. 1957, Johns Hopkins University

George Jerome Schonholtz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, New York University; M.D. 1954, State University of New York Downstate Medical Center

Lynne Mary Schoonover, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1971, M.S. 1972, Pennsylvania State University; M.D. 1978, University of Virginia

Simeon Baruch Schreiber, *Assistant Clinical Professor of Surgery (Otolaryngology)*
B.A. 1969, M.D. 1973, Yeshiva University

Marianne Schuelein, *Special Lecturer in Child Health and Development*
A.B. 1955, Wellesley College; M.D. 1959, New York University

Carol Ann Brimberg Schulman, *Assistant Clinical Professor of Child Health and Development*
A.B. 1966, Radcliffe College; M.D. 1970, Georgetown University

Cyril Augustus Schulman, *Clinical Professor of Medicine*
B.S. 1938, M.D. 1942, George Washington University

Jeffrey Arnold Schulman, *Assistant Professor of Health Care Sciences*
B.A. 1970, Rutgers—The State University; M.A. 1971, Jersey City State College; M.S. 1974, Ph.D. 1978, Virginia Commonwealth University

Joseph Daniel Schulman, *Professor of Obstetrics and Gynecology*
B.A. 1961, City University of New York, Brooklyn College; M.D. 1966, Harvard University

Richard Scott Schulof, *Assistant Professor of Medicine and of Biochemistry*
B.A. 1968, Cornell University; M.D., Ph.D. 1975, Yeshiva University

Morris Aaron Schultz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1955, Rice University; M.D. 1959, University of Texas Medical Branch at Galveston

Thomas Aaron Schultz, *Assistant Clinical Professor of Health Care Sciences*
Ph.B. 1967, B.S. 1969, University of North Dakota; M.D. 1971, Wake Forest University

Harry Arie Schumann, *Clinical Instructor in Medicine*
B.A. 1971, Northwestern University; M.D. 1975, Medical College of Wisconsin

Maxine Ann Schurter, *Associate Clinical Professor of Surgery*
A.B. 1944, Pomona College; M.D. 1951, George Washington University

Glenn Warren Schwarcz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1974, Georgetown University

Arnold Melvin Schwartz, *Assistant Professor of Pathology*
B.A. 1967, City University of New York, Queens College; Ph.D. 1973, Massachusetts Institute of Technology; M.D. 1978, University of Miami

David Taylor Schwartz, *Assistant Clinical Professor of Urology*
B.A. 1959, Harvard University; M.D. 1963, Columbia University

Don Elliot Schwartz, *Assistant Clinical Professor of Ophthalmology*
B.S. 1963, City University of New York, Queens College; M.D. 1967, Yeshiva University

Frederick Tovi Schwartz, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, American International College; M.D. 1969, George Washington University

Richard Harvey Schwartz, *Associate Clinical Professor of Child Health and Development*
B.A. 1960, George Washington University; M.D. 1965, Georgetown University

Stanley Alvin Schwartz, *Assistant Clinical Professor of Medicine*
B.S. 1955, Alfred University; M.D. 1959, Albany Medical College of Union University

Noel Asher Schweig, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, Wesleyan University; M.D. 1956, Duke University

Agnes Eva Schweitzer, *Assistant Clinical Professor of Child Health and Development*
B.S. 1955, M.D., C.M. 1959, McGill University, Canada

Lewis Pennington Scott III, *Professor of Child Health and Development*
M.D. 1954, Thomas Jefferson University

Richard Nathaniel Scott, *Special Lecturer in Surgery*
A.B. 1963, Lincoln University; M.D. 1967, Howard University

Samuel J. Scott, Jr., *Associate Professor of Medicine*
B.S. 1966, M.D. 1970, George Washington University

Thomas Walter Scott, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1969, M.D. 1973, George Washington University

Winfield Harker Scott, *Associate Professor of Medicine and of Psychiatry and Behavioral Sciences; Associate Dean of the Medical Center, for Education; Director of the Office of Education*
B.S. 1954, M.S. 1955, Ph.D. 1958, Pennsylvania State University

Joan Rice Sealy, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, University of Chicago; M.D. 1968, George Washington University

Amiel Segal, *Associate Clinical Professor of Medicine (Hematology Oncology)*
B.A. 1962, Harvard University; M.D. 1966, University of Pennsylvania

Stuart Floyd Seides, *Associate Clinical Professor of Medicine*
B.S. 1967, Pennsylvania State University; M.D. 1970, Cornell University

Ira Seiler, *Special Lecturer in Child Health and Development*
M.D. 1956, State University of New York Downstate Medical Center

David Murray Seitzman, *Assistant Clinical Professor of Urology*
B.A. 1951, M.D. 1954, Vanderbilt University

Paul Marvin Selfon, *Assistant Clinical Professor of Medicine*
B.S. 1950, Pennsylvania State University; M.D. 1955, Thomas Jefferson University

Mark Harris Selikson, *Adjunct Assistant Professor of Radiology*
B.S. 1971, University of Rochester; Ph.D. 1978, Washington University

Alvin Seltzer, *Associate Clinical Professor of Medicine*
B.S. 1937, M.D. 1941, University of Illinois

Hrant Samuel Semerjian, *Associate Clinical Professor of Urology*
B.S. 1962, M.D. 1965, American University of Beirut, Lebanon

John Louis Sever, *Professorial Lecturer in Child Health and Development and in Obstetrics and Gynecology*
M.D., Ph.D. 1957, Northwestern University

John Christopher Seymour, *Assistant Clinical Professor of Medicine*
B.A. 1961, Brown University; M.D. 1965, George Washington University

Catherine Mary Shaer, *Clinical Instructor in Child Health and Development*
B.A. 1974, Quinnipiac College; M.D. 1978, University of Texas Health Science Center at San Antonio

Carolyn S. Shaffer, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1968, Pennsylvania State University; M.Ed. 1972, Ph.D. 1976, University of Virginia

Michael John Shaffer, *Associate Professor of Anesthesiology*
B.S.E.E. 1949, Leeds University, England; M.S. in E.E. 1974, D.Sc. 1981, George Washington University

Parvez Ilyas Shah, *Clinical Instructor in Urology*
M.B., B.S. 1960, Dow Medical College, Pakistan

Mohammad B. G. Shahvari, *Associate Professor of Anesthesiology*
M.D. 1968, Pahlavi University, Iran; M.S. 1973, Temple University

Sheila Ann Shanahan, *Assistant Clinical Professor of Child Health and Development*
B.A. 1963, Trinity College, District of Columbia; M.D. 1969, Medical College of Pennsylvania

Jay Robert Shapiro, *Associate Clinical Professor of Medicine*
B.S. 1953, Franklin and Marshall College; M.D. 1957, Boston University

Roger Lee Shapiro, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, M.D. 1949, University of Chicago

Stephen Robert Shapiro, *Associate Professor of Child Health and Development*
B.S. 1963, Tufts University; M.D. 1967, New York University

Steven Samuel Sharfstein, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Dartmouth College; M.D. 1968, Yeshiva University; M.P.A. 1973, Harvard University

Donald Alan Sharp, *Adjunct Assistant Professor of Health Care Sciences*
B.A. 1971, Tennessee Technological University; M.D. 1974, University of Tennessee

David James Sharpe, *Professor of Law and of Medical and Public Affairs*
A.B. 1950, University of North Carolina; LL.B. 1955, S.J.D. 1969, Harvard University

Benjamin Alfonza Shaver, *Assistant Clinical Professor of Child Health and Development*
B.S. 1952, Massachusetts Institute of Technology; M.D. 1956, Yale University

Samuel Hazen Shea, *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1933, M.D. 1936, George Washington University

Robert B. Shearin, *Special Lecturer in Child Health and Development*
B.S. 1964, North Carolina State University at Raleigh; M.D. 1968, University of North Carolina

Michael Mendel Shefferman, *Assistant Clinical Professor of Medicine*
B.A. 1958, Johns Hopkins University; M.D. 1962, University of Maryland

Joseph Bart Sheffery, *Professorial Lecturer in Obstetrics and Gynecology*
M.D. 1937, Georgetown University

Samuel Ainslie Shelburne, Jr., *Professor of Neurology and of Child Health and Development*
A.B. 1956, Princeton University; M.D. 1960, University of Texas, Southwestern Medical School at Dallas

John Henry Shelby, *Adjunct Assistant Professor of Health Care Sciences*
M.A. 1972, Trinity University; M.D. 1975, University of Texas, Southwestern Medical School at Dallas

Peter Bruce Sherer, *Assistant Clinical Professor of Medicine*
B.S. 1972, Rensselaer Polytechnic Institute; M.D. 1972, Albany Medical College of Union University

Joseph Lee Sheridan, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1939, M.D. 1943, Indiana University

Barbara Ensfield Sherwin, *Assistant Clinical Professor of Medicine*
B.S. 1959, Antioch College; M.D. 1967, George Washington University

Lynn Karen Shesser, *Adjunct Instructor in Health Care Sciences*
B.S.N. 1975, University of Rochester; M.S.N. 1977, University of Pennsylvania

Robert F. Shesser, *Assistant Professor of Health Care Sciences (Emergency Medicine) and of Medicine*
B.A. 1971, University of Rochester; M.D. 1976, University of Miami

David Hanson Shivers, *Adjunct Instructor in Health Care Sciences*

Paul Edgar Shorb, Jr., *Professor of Surgery*
A.B. 1951, Williams College; M.D. 1955, Johns Hopkins University

Milton F. Shore, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1949, Harvard University; M.A. 1950, Ph.D. 1955, Boston University

Billie Lou Short, *Assistant Professor of Child Health and Development*
B.S. 1969, Northwestern Oklahoma State University; M.D. 1974, University of Oklahoma

Frederick Loy Shultz, *Adjunct Instructor in Health Care Sciences*

George Michael Shumaik, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1973, M.D. 1974, University of Colorado

Charles Jerome Shuman, *Adjunct Assistant Professor of Medicine*
B.S. 1969, University of Maryland; M.A. 1970, Catholic University of America; D.P.M. 1975, Pennsylvania College of Podiatric Medicine

Irwin Shuman, *Assistant Clinical Professor of Urology*
B.S. 1955, George Washington University; M.D. 1959, Georgetown University

James Buren Sidbury, Jr., *Professor of Child Health and Development*
B.S. 1944, Yale University; M.D. 1947, Columbia University

Herschel Sidransky, *Professor of Pathology; Chairman of the Department of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

David Alan Siegel, *Clinical Instructor in Child Health and Development*
B.S. 1973, State University of New York at Stony Brook; M.D. 1976, New York Medical College

Robert Stanley Siegel, *Clinical Instructor in Surgery (Oral Surgery)*
B.S. 1958, D.D.S. 1961, University of Maryland

Rubin Louis Siegel, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.S. 1930, City University of New York, City College; M.D. 1936, Royal Colleges, Scotland

Tomas Jose Silber, *Associate Professor of Child Health and Development*
B.A. 1959, Colegio Acassuso, Argentina; M.D. 1966, University of Buenos Aires, Argentina; M.A. in Sp.Std. 1979, George Washington University

Howard M. Silby, *Assistant Clinical Professor of Neurology*
B.A. 1957, Dartmouth College; M.D. 1962, State University of New York at Buffalo

Carlos Alberto Silva, *Associate Clinical Professor of Surgery*
B.S. 1956, University of Puerto Rico, M.D. 1960, George Washington University

Omega Logan Silva, *Associate Professor of Medicine*
B.S. 1958, M.D. 1967, Howard University

Harold Martin Silver, *Clinical Professor of Medicine*
A.B. 1946, M.D. 1949, Columbia University

Sylvia Silver, *Assistant Professor of Medical Technology in Pathology*
B.A. 1965, Drake University, M.T.S. 1975, D.A. 1977, Catholic University of America

Steven George Silverberg, *Professor of Pathology*
A.B. 1958, City University of New York, Brooklyn College, M.D. 1962, Johns Hopkins University

Mary Rottschaeffer Silverman, *Adjunct Assistant Professor of Health Care Sciences*
B.S.N. 1965, M.P.H. 1970, University of Michigan

Martin Elliot Silverstein, *Adjunct Professor of Health Care Sciences*
B.A. 1945, Columbia University; M.D. 1948, New York Medical College

David Bart Simon, *Associate Clinical Professor of Medicine*
M.D. 1967, George Washington University

Gary Leonard Simon, *Assistant Professor of Medicine*
B.S. 1968, M.D. 1975, University of Maryland, M.S. 1970, Ph.D. 1972, University of Wisconsin

Kenneth Alan Simon, *Assistant Clinical Professor of Ophthalmology*
B.A. 1952, University of Pennsylvania; M.S. 1955, M.D. 1957, Yale University

Dorothy G. Simons, *Lecturer in Medical Technology in Pathology*
B.S. 1975, George Washington University

Kermit Oscar Simrel, *Assistant Clinical Professor of Child Health and Development*
B.S. 1970, Howard University, M.D. 1974, Duke University

Timothy James Singer, *Adjunct Assistant Professor of Health Care Sciences*
B.A. 1973, Reed College, M.S. 1975, M.Phil. 1976, Ph.D. 1977, Yale University

Nalini Singh, *Clinical Instructor in Child Health and Development*
M.B., B.S. 1973, Institute of Medical Sciences, India

Ravinder Singh, *Adjunct Assistant Professor of Pathology*
M.B., B.S. 1971, M.A.M. College, India

Maurice Arthur Sislen, *Assistant Clinical Professor of Medicine*
A.B. 1944, M.D. 1947, George Washington University

James Glover Sites, *Professor of Obstetrics and Gynecology*
M.D. 1947, George Washington University

John Chauncey Skilling, *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1955, Princeton University, M.D. 1961, Hahnemann Medical College

Marvin Ralph Skolnick, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Emory University; M.D. 1963, Yale University

Frank James Slaby, *Associate Professor of Anatomy*
B.S. 1965, California Institute of Technology, Ph.D. 1971, University of California, Berkeley

Barton Kent Slemmons, *Associate Professor of Orthopaedic Surgery*
B.A. 1952, University of North Dakota, M.D. 1954, University of Illinois

Bernard Slosberg, *Associate Clinical Professor of Medicine (Internal Medicine)*
B.S. 1963, Massachusetts Institute of Technology, M.D. 1967, Yeshiva University, M.P.H. 1974, Johns Hopkins University

Ridge Michael Sly, *Professor of Child Health and Development*
A.B. 1956, Kenyon College; M.D. 1960, Washington University

Allen Small, *Associate Clinical Professor of Surgery (Otolaryngology)*
B.A. 1962, Columbia University; M.D. 1966, State University of New York Downstate Medical Center

Adrienne Monica Smith, *Instructor in Neurology and in Child Health and Development*
B.A. 1964, New York University; M.D. 1976, Medical College of Pennsylvania

Barry Hamilton Smith, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, Harvard University; Ph.D. 1968, Massachusetts Institute of Technology; M.D. 1972, Cornell University

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

Bruce Hamilton Smith, *Professor of Pathology*
A.B. 1940, M.D. 1943, Syracuse University

Carol Ann Smith, *Instructor of Medical Technology in Pathology*
B.S. 1971, University of Maryland; M.S. 1981, Medical College of Virginia of Virginia Commonwealth University

James Cecil Smith, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1956, M.S. 1959, Ph.D. 1964, University of Maryland

James Joseph Smith, *Clinical Professor of Radiology (Nuclear Medicine)*
B.A. 1932, Catholic University of America; M.D. 1940, Yale University

Joseph H. Smith, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, M.D. 1952, University of Virginia

Mark Stephen Smith, *Assistant Professor of Health Care Sciences (Emergency Medicine) and of Medicine*
B.A. 1968, Swarthmore College; M.S. 1971, Stanford University; M.D. 1977, Yale University

Robert Benjamin Warfield Smith, *Associate Clinical Professor of Medicine*
M.D. 1949, Columbia University

Francine Smithline, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1971, University of Chicago; M.D. 1974, State University of New York at Stony Brook

Richard Paul Smock, *Adjunct Instructor in Health Care Sciences*

Bruce Melvyn Smoller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Cornell University; M.D. 1969, Tulane University

Nicholas Patrick Dillon Smyth, *Associate Clinical Professor of Surgery*
M.S. 1948, M.B., Ch.B. 1949, University College, Ireland; M.S. 1954, University of Michigan

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery; Chairman of the Department of Anatomy*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, London University, England

Joseph Snyder, *Assistant Clinical Professor of Ophthalmology*
A.B. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

Edgar Henry Soifer, *Assistant Clinical Professor of Urology*
B.A. 1953, Washington and Jefferson College; M.D. 1957, New York University

Jose Tomas Solano, *Assistant Clinical Professor of Medicine*
B.S. 1951, Colegio San Bartolome, Colombia; M.D. 1957, Javeriana University, Colombia

Carol Rizer Somogyi, *Adjunct Instructor in Radiology*

Eliot Sorel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, New York University; M.D. 1971, State University of New York Downstate Medical Center

Kevin Raymond Sorem, *Adjunct Assistant Professor of Health Care Sciences*
A.B. 1976, Rhode Island College; B.S. 1973, State University of New York at Stony Brook

Lawrence Fredric Sorkin, *Assistant Professor of Child Health and Development and of Medicine*
A.B. 1969, Colgate University; M.D. 1974, University of Health Sciences/Chicago Medical School

Eleanor Attianese Sorrentino, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Bryn Mawr College; M.D. 1962, Harvard University

Stuart M. Sotsky, *Associate Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, M.D., M.P.H. 1971, Johns Hopkins University

Richard M. Fairfax Southby, *Associate Professor of Health Services Administration and of Health Care Sciences; Chairman of the Department of Health Services Administration*
B.Com. 1965, University of Melbourne, Australia; M.P.A. 1967, Cornell University; Ph.D. 1973, Monash University, Australia

Gary Jan Soverow, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1968, Princeton University; M.D. 1972, Harvard University

Peter Soyster, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1948, George Washington University

Samuel Vincent Spagnolo, *Professor of Medicine*
B.A. 1961, Washington and Jefferson College; M.D. 1965, Temple University

George Speck, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1937, University of Michigan; M.D. 1941, George Washington University

Israel Spector, *Assistant Clinical Professor of Medicine*
B.S. 1958, City University of New York, Brooklyn College; M.D. 1962, University of Health Sciences/Chicago Medical School

Jeffrey Lynn Speller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, Haverford College; M.D. 1974, M.B.A. 1979, Harvard University

Ian James Spence, *Assistant Clinical Professor of Urology*
B.S. 1955, Union College, New York; M.D. 1959, Albany Medical College of Union University

Chariklia Tziraki Spiegel, *Associate Professor of Medicine and of Health Care Sciences*
B.A. 1969, University of California, Berkeley; M.D. 1973, University of California, San Francisco

Paul Stephen Spiegler, *Clinical Instructor in Medicine*
B.A. 1960, New York University; M.D. 1969, George Washington University

Ira Jay Spiro, *Assistant Research Professor of Radiology*
B.A. 1976, LaSalle College; Ph.D. 1981, Colorado State University

Kenneth Robert Spring, *Associate Professorial Lecturer in Physiology*
D.M.D. 1966, Tufts University; Ph.D. 1971, State University of New York at Buffalo

Jeanne Spurlock, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1947, Howard University

Marie Della Porta Stahl, *Adjunct Instructor in Health Care Sciences*
B.S. 1975, Georgetown University; M.S. 1980, University of Rochester

Gary Scott Staples, *Assistant Clinical Professor of Radiology*
B.S. 1962, Baldwin-Wallace College; M.D. 1966, Ohio State University

William Stark, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1939, New York University; M.D. 1943, University of Louisville

Henry Joseph Starr, *Clinical Instructor in Ophthalmology*
B.A. 1955, Bowdoin College; M.D. 1959, Johns Hopkins University

Ruth Lebo Steerman, *Assistant Clinical Professor of Child Health and Development*
M.D. 1967, George Washington University

Edward Steers, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1959, Ph.D. 1963, University of Pennsylvania

Thomas Kostas Stefanakos, *Adjunct Instructor in Radiology*
B.S. 1964, Upper Iowa University; M.S. 1973, Georgia Institute of Technology

Arthur Harold Stein, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Harvard University; M.D. 1966, Cornell University

Harry Calvin Stein, *Clinical Instructor in Surgery (Otolaryngology)*
B.S. 1961, Loyola College; M.D. 1965, University of Maryland

Walter Anthony Stein, *Assistant Professor of Health Care Sciences*
B.S. 1973, State University of New York at Stony Brook; M.A. in H.C.A. 1981, George Washington University

Harvey Steinberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

Paul Jay Steinberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, University of Pennsylvania; M.D. 1974, State University of New York Downstate Medical Center

William Mark Steinberg, *Assistant Professor of Medicine (Gastroenterology)*
B.A. 1966, Columbia University; M.D. 1970, New York University

Harvey Jay Steinfeld, *Assistant Clinical Professor of Health Care Sciences*
M.D. 1965, State University of New York Downstate Medical Center

Peter Joseph Steinglass, *Professor of Psychiatry and Behavioral Sciences and of Health Care Sciences*
A.B. 1960, Union College; M.D. 1965, Harvard University

Robert Frederic Stephens, *Assistant Clinical Professor of Ophthalmology*
B.S. 1967, University of Oklahoma; M.D. 1971, Washington University

Moises N. Steren, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1953; M.D. 1959, Litoral University, Argentina

Melvin Joseph Stern, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1961, M.D. 1965, Yeshiva University

Robert Glen Stevenson, Jr., *Assistant Clinical Professor of Health Care Sciences*
B.S. 1976, University of Nebraska

Steele Fuller Stewart, Jr., *Associate Clinical Professor of Obstetrics and Gynecology*
A.B. 1950, Carleton College; M.D. 1959, University of Pennsylvania

Rolf William Steyn, *Adjunct Associate Professor of Psychiatry and Behavioral Sciences*
B.S. 1952, City University of New York, Queens College; M.D. 1957, University of Rochester

James Austin Stickland, *Special Lecturer in Radiology*

Robert Joseph Stillman, *Associate Professor of Obstetrics and Gynecology*
B.A. 1969, Boston University; M.D. 1973, Georgetown University

Merril Stock, *Assistant Clinical Professor of Medicine*
B.S. 1967, Albright College; M.D. 1971, Thomas Jefferson University

William James Stockton, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1956, University of Oklahoma

Gerald Virgil Stokes, *Associate Professor of Microbiology*
B.A. 1967, Southern Illinois University; Ph.D. 1973, University of Chicago

Myer Harold Stolar, *Clinical Professor of Medicine*
B.S. 1936, George Washington University; M.D. 1941, Georgetown University

Samuel Stoleru, *Assistant Clinical Professor of Ophthalmology*
B.S. 1961, Colegio Hebreo Jorge Isaacs, Colombia; M.D. 1968, Universidad del Valle, Colombia

Alan William Stone, *Associate Professor of Health Care Sciences and of Medicine*
B.A. 1961, Harvard University; M.D. 1966, Yale University

Bernard Stopak, *Assistant Clinical Professor of Neurological Surgery*
B.S. 1959, University of Maryland; M.D. 1970, Université de Montpellier, France

Belinda Crompton Straight, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1952, New York University

Robert Edward Strange, *Adjunct Professor of Psychiatry and Behavioral Sciences*
M.D. 1957, Indiana University

Fred Strassburger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1954, University of Colorado; Ph.D. 1963, Stanford University

James Ashley Straw, *Professor of Pharmacology*
B.S. 1958, Ph.D. 1963, University of Florida

Franklin Lyle Stroud, *Clinical Instructor in Child Health and Development*
B.S. 1961, M.D. 1965, University of Illinois

Samuel Jacob Nathan Sugar, *Associate Clinical Professor of Health Care Sciences*
Phar.G. 1931, M.D. 1938, George Washington University

Michael Daniel Sulkin, *Special Lecturer in Surgery*
A.B. 1961, University of Pennsylvania; M.D. 1966, Boston University

Thomas J. Sullivan, *Associate Clinical Professor of Child Health and Development*
B.A. 1960, M.D. 1964, Seton Hall University

Roberto Novarro Sunga, *Assistant Clinical Professor of Ophthalmology*
M.D. 1958, University of the Philippines

Louise Elaine Swanberg, *Assistant Professor of Medicine*
B.A. 1971, University of Colorado; M.D. 1976, Creighton University

Robert Michael Sweet, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1974, Denison University; D.M.D. 1971, M.D. 1976, Medical University of South Carolina

Stanley Jerome Talpers, *Associate Clinical Professor of Medicine*
B.A. 1948, M.D. 1953, University of Colorado

Irene Gorski Tamagna, *Professor of Medicine*
M.D. 1943, Medical College of Pennsylvania

Ira Roy Tannebaum, *Clinical Instructor in Surgery*
B.S. 1966, Pennsylvania State University; M.D. 1968, Thomas Jefferson University

Annop Tantisunthorn, *Assistant Clinical Professor of Child Health and Development*
M.D. 1966, Tokyo Medical and Dental University, Japan

Hazel McGee Tape, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1966, Tougaloo College; M.A. 1968, Johns Hopkins University; M.D. 1977, University of Maryland

Nelson Monroe Tart, *Clinical Professor of Obstetrics and Gynecology*
B.S. 1949, Wake Forest University; M.D. 1955, George Washington University

Albert Hiram Taub, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences*
B.S. 1956, City University of New York, City College; M.D. 1961, Yeshiva University

Floyd Elliot Taub, *Adjunct Assistant Professor of Pathology*
B.S. 1974, M.D. 1976, Northwestern University

Joel M. Taubin, *Assistant Clinical Professor of Medicine*
B.A. 1963, M.A. 1965, George Washington University; M.D. 1969, University of Virginia

Edith S. Taylor, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1945, Radcliffe College; M.D. 1949, Harvard University

Elmer Eugene Taylor, *Special Lecturer in Health Care Sciences*

Bahman Teimourian, *Special Lecturer in Surgery*
B.S. 1954, Bethany College; M.D. 1958, George Washington University

Terry Alan Teplitz, *Clinical Instructor in Psychiatry and Behavioral Sciences*
A.B. 1971, Washington University; M.D. 1975, University of Maryland at Baltimore

Bernard Scott Teunis, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.A. 1958, M.D. 1962, University of Virginia

James Richard Thistlethwaite, *Clinical Professor of Surgery*
B.S. 1943, University of Richmond; M.D. 1947, Duke University

Greg Paul Thomas, *Assistant Professor of Health Care Sciences; Assistant Director of the Office of Continuing Education*
B.S. 1975, Xavier University; B.S. 1977, Baylor University; M.P.H. 1978, University of Texas Health Science Center at Houston

Patricia Ann Thomas, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.A. 1972, Colby College; M.D. 1976, Rutgers—The State University

Anne Marie Salmon Thompson, *Associate Professor of Medicine*
A.B. 1963, Immaculata College, Pennsylvania; M.D. 1967, Thomas Jefferson University

Charles Waters Thompson, *Clinical Professor of Medicine*
M.D. 1941, George Washington University

David Herron Thompson, *Special Lecturer in Health Care Sciences*
B.S. 1968, University of Miami; M.D. 1972, Ohio State University

Lewis William Thompson, *Associate Professor of Surgery and of Child Health and Development*
A.B. 1955, Asbury College; M.D. 1960, Wake Forest University

William Frederic Thompson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1963, City University of New York, City College; M.D. 1967, George Washington University

Gary Boyd Thurman, *Adjunct Professor of Biochemistry*
B.S. 1966, Brigham Young University; Ph.D. 1970, University of Utah

Gertrude Ruth Ticho, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1944, University of Vienna, Austria

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology and Professor of Education*
A.B. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
A.B. 1951, Mount Holyoke College; M.S. 1955, Ph.D. 1959, University of Wisconsin; Sc.D. 1973, Wilson College; D.Sc. 1974, Trinity College, District of Columbia; L.H.D. 1976, Mount Holyoke College; HH.D. 1977, St. Mary's College, Indiana; D.Sc. 1977, Cedar Crest College; D.Sc. 1978, University of the South; D.Sc. 1979, Goucher College; Litt.D. 1980, Regis College; Litt.D. 1980, College of St. Catherine; HH.D. 1982, Hood College

Harold Stanley Tidler, *Clinical Instructor in Surgery*
M.D. 1949, George Washington University

Mary Barbara Tierney, *Assistant Clinical Professor of Child Health and Development*
B.A. 1966, Marquette University; M.D. 1970, University of Minneapolis

Andrew L. Tievsky, *Assistant Professor of Radiology (Neuroradiology)*
B.A. 1970, University of Rochester; M.D. 1974, George Washington University

George Tievsky, *Assistant Clinical Professor of Radiology*
B.S. in Pharm. 1939, M.D. 1943, George Washington University

Donn Lloyd Tippett, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, Ohio State University

Evadne Marjorie Titer, *Clinical Instructor in Ophthalmology*
B.S. 1963, M.D. 1967, Howard University

Charles Cameron Titus, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, Oberlin College; M.D. 1960, Case Western Reserve University

Elijah White Titus, Jr., *Clinical Professor of Obstetrics and Gynecology*
M.D. 1952, George Washington University

Jane Wendy Lehu Todaro, *Associate Professor of Child Health and Development*
B.A. 1960, Vassar College; M.D. 1965, New York University

John D. Toft II, Adjunct Assistant Professor of Pathology
D.V.M. 1964, Ohio State University; M.S. 1972, Wake Forest University

Xenia Tonesk, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1969, M.A. 1977, Ph.D. 1977, Catholic University of America

Kathleen Elinor Toomey, *Assistant Professor of Child Health and Development*
B.S. 1969, University of Toledo; M.D. 1973, Medical College of Pennsylvania

Charles Eby Townsend, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, M.D. 1951, George Washington University

Howard Pettit Treichler, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1946, George Washington University

Carl Vernon Tresnak, *Special Lecturer in Pathology*

William MacLohon Trible, *Clinical Professor of Surgery (Otolaryngology)*
A.B. 1943, Princeton University; M.D. 1950, George Washington University; M.S. in Med. 1956, University of Pennsylvania

Gordon Anderson Tripp, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1957, Harvard University; M.D. 1961, Duke University

Hugh Henry Trout III, *Associate Professor of Surgery*
B.S. 1963, Washington and Lee University; M.D. 1967, Duke University

Nelson Perez Trujillo, *Clinical Professor of Medicine*
B.S. 1955, Baldor Academy, Cuba; M.D. 1962, Tulane University

Neofytos Theodore Tsangaris, *Professor of Surgery; Acting Chairman of the Department of Surgery*
B.S. 1952, Duke University; M.D. 1956, George Washington University

Carmelita Uichanco Tuazon, *Professor of Medicine*
B.S. 1963, M.D. 1967, University of the Philippines

Ira Nathan Tublin, *Associate Clinical Professor of Medicine*
B.S. 1950, M.D. 1954, University of Maryland

Thomas W. Turbiak, *Assistant Professor of Health Care Sciences (Emergency Medicine)*
B.S. 1975, Fordham University; M.D. 1979, Georgetown University

Lester Turner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1958, M.A. 1960, Ph.D. 1967, University of Texas

Maria Lourdes Turner, *Associate Professor of Dermatology*
B.S. 1958, M.D. 1961, University of the Philippines

Virginia M. Turner, *Adjunct Assistant Professor of Parasitology in Microbiology*
B.S. 1960, Towson State University

David E. Uddin, *Assistant Professorial Lecturer in Pathology*
B.S. 1963, Drake University; Ph.D. 1967, University of Illinois

Arthur Richard Ugel, *Associate Clinical Professor of Dermatology and of Child Health and Development*
B.S. 1961, M.D. 1965, George Washington University

Marion Lazar Usher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, McGill University, Canada; M.S. in S.W. 1965, University of Wisconsin

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

Martin John Valaske, *Professor of Pathology; Medical Director, Medical Faculty Associates*
Ph.B. 1950, M.D. 1954, Marquette University

John David Van Brakle, *Assistant Professor of Child Health and Development*
B.S. 1970, Muhlenberg College; M.D. 1974, George Washington University

Jack Yehudi Vanderhoek, *Assistant Research Professor of Biochemistry*
B.S. 1969, City University of New York, City College; Ph.D. 1986, Massachusetts Institute of Technology

Joseph Aaron Vander Walde, *Assistant Clinical Professor of Child Health and Development*
B.S. 1971, University of Wisconsin; M.D. 1975, University of Pennsylvania

Robert James Van Houten, *Professor of Anesthesiology; Associate Dean of the Medical Center for Graduate Medical Education*
B.S. 1950, Albright College; M.D. 1954, Hahnemann Medical College

Douglas Van Nostrand, *Assistant Clinical Professor of Radiology*
B.S. 1969, Duke University; M.D. 1973, Emory University

Palathinkal Jacob Varghese, *Professor of Medicine and of Child Health and Development*
M.B., B.S. 1958, Kerala University, India; M.R.C.P. 1962, Royal College of Physicians, Scotland; M.R.C.P. 1963, Royal College of Physicians, England

Vijay Mohan Varma, *Professor of Radiology*
M.B., B.S. 1958, Osmania University, India; M.D. 1963, All India Institute of Medical Sciences

Marc Vatin, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1971, University of Marseille, France; M.P.H. 1979, University of North Carolina

Alan Robert Vinitsky, *Clinical Instructor in Child Health and Development*
B.S. 1970, University of Maryland; M.D. 1974, University of Pennsylvania

Brantley Paul Vitek, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1957, Western Maryland College; M.D. 1961, University of Maryland

Lawrence Anthony Vitulano, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1972, Georgetown University; Ph.D. 1977, Catholic University of America

Rocco Joseph Volpe, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1966, Villanova University; M.D. 1970, New York Medical College

Manfred A. Von Fricken, *Assistant Clinical Professor of Ophthalmology*
A.B. 1971, M.M.S. 1973, Rutgers—The State University, M.D. 1975, Washington University

Ralph Weyman Wadeson, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, University of Alabama

Gerald Eugene Wagner, *Assistant Professor of Microbiology*
B.S. 1972, Emory and Henry College, M.S. 1975, Ph.D. 1977, Medical College of Virginia of Virginia Commonwealth University

Martha Jane Wagner, *Assistant Clinical Professor of Health Care Sciences and of Child Health and Development*
B.A. 1964, DePauw University, M.D. 1967, University of Louisville, M.P.H. 1978, Johns Hopkins University

Chester Leeroy Wagstaff, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1944, University of Richmond, M.D. 1951, University of Pennsylvania

Harold J. Wain, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, City University of New York, Brooklyn College, M.A. 1966, Columbia University, Ph.D. 1970, University of Nebraska

Robert Stephen Waldman, *Clinical Instructor in Medicine*
B.A. 1957, University of Pennsylvania, M.D. 1961, Georgetown University

Dirk Barrett Waldron, *Special Lecturer in Pathology*

Jeremy Peter Waletzky, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Yale University; M.D. 1968, Columbia University

Glenn Anthony Walker, *Professor of Biochemistry*
B.A. 1958, Ph.D. 1963, Bellarmine College

Dennis Taylor Wallace, *Adjunct Instructor in Health Care Sciences*
B.S. 1972, Ball State University

Marsha T. Wallace, *Clinical Instructor in Medicine*
B.A. 1972, University of Pennsylvania, M.D. 1976, Hahnemann Medical College

William Davies Wallace, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1949, Westminster College, Pennsylvania, M.D. 1953, Thomas Jefferson University

James Christopher Walsh, Jr., *Clinical Professor of Obstetrics and Gynecology*
B.A. 1941, M.D. 1945, Georgetown University

Raymond John Walsh, *Associate Professor of Anatomy*
B.S. 1969, University of Massachusetts, Ph.D. 1978, Tufts University

David Murray Wanicur, *Assistant Clinical Professor of Ophthalmology*
B.A. 1961, University of Pennsylvania, M.D. 1965, University of Pittsburgh

Richard James Warchol, *Assistant Professor of Medicine*
A.B. 1967, Millikin University, M.D. 1972, George Washington University

Archibald F. Ward, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences (Sociology)*
B.S. 1933, North Carolina State University at Raleigh, B.D. 1937, Crozer Theological Seminary, Ph.D. 1947, University of Maryland

Robert Edward Ware, *Assistant Clinical Professor of Urology*
M.D. 1953, Medical College of Virginia of Virginia Commonwealth University

Alan Gary Wasserman, *Assistant Professor of Medicine*
B.A. 1969, Rutgers—The State University, M.D. 1973, Hahnemann Medical College

Daniel Hough Waterman, *Assistant Clinical Professor of Medicine*
B.S. 1966, Trinity College, Connecticut; M.D. 1973, Hahnemann Medical College

Elzberry Waters, Jr., *Research Professor of Medical and Public Affairs*
B.A. 1963, M.A. 1966, George Washington University; Ph.D. 1973, American University

Donald Morgan Watkin, *Research Professor of Medicine*
A.B. 1943, Hamilton College; M.D. 1946, M.P.H. 1965, Harvard University

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1963, University of Louisville; Ph.D. 1968, University of Wisconsin

Donald Charles Watson, Jr., *Assistant Professor of Surgery and of Child Health and Development*
B.A., B.S. 1968, Lehigh University; M.S. 1969, Stanford University; M.D. 1972, Duke University

Susan Robertson Prince Watson, *Associate Professor of Anesthesiology and of Child Health and Development*
B.A. 1967, University of North Carolina; M.D. 1971, Duke University

Benny Waxman, *Professor of Obstetrics and Gynecology*
M.D. 1957, University of Western Ontario, Canada

Kenneth Earl Weaver, *Assistant Professor of Radiology*
B.S. 1964, California State University, Los Angeles; M.S. 1968, Oregon State University

Blair McWhorter Webb, *Clinical Professor of Surgery (Otolaryngology) and of Child Health and Development*
B.S. 1951, Hampden-Sydney College; M.D. 1955, University of Virginia

Thomas Glenn Webster, *Professor of Psychiatry and Behavioral Sciences*
A.B. 1946, Fort Hays Kansas State College; M.D. 1949, Wayne State University

William Dean Wehunt, *Assistant Clinical Professor of Radiology*
B.S. 1968, Mercer University; M.D. 1972, Vanderbilt University

Lawrence Mark Weinberg, *Clinical Instructor in Medicine*
B.A. 1972, Wesleyan University; M.D. 1976, Boston University

Daniel Roy Weinberger, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1969, Johns Hopkins University; M.D. 1973, University of Pennsylvania

Harold Weiner, *Clinical Professor of Psychiatry and Behavioral Sciences (Experimental Psychology)*
B.B.A. 1953, City University of New York, City College; M.A. 1957, Ph.D. 1960, University of Maryland

Jay Harlan Weiner, *Assistant Clinical Professor of Medicine*
B.A. 1971, M.D. 1975, George Washington University

Allan Byrne Weingold, *Professor of Obstetrics and Gynecology; Chairman of the Department of Obstetrics and Gynecology*
B.A. 1951, Oberlin College; M.D. 1955, New York Medical College

Jacob Joseph Weinstein, *Clinical Professor of Surgery*
Phar.G. 1930, B.S. 1934, M.D. 1936, University of Maryland

Zelig Reuven Weinstein, *Assistant Clinical Professor of Radiology*
B.S. 1970, City University of New York, City College; M.D. 1975, State University of New York Downstate Medical Center

Herbert D. Weintraub, *Professor of Anesthesiology*
B.A. 1950, New York University; M.A. 1958, M.B., Ch.B. 1959, Oxford University, England

Paul Stephen Weisberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1952, Harvard University; M.D. 1958, Marquette University

Daniel Leigh Weiss, *Clinical Professor of Pathology*
B.A. 1943, M.D. 1946, Columbia University

Harold Weiss, *Associate Clinical Professor of Medicine*
B.A. 1954, New York University, M.D. 1959, University of Health Sciences/Chicago Medical School

Ira Paul Weiss, *Associate Professor of Child Health and Development*
B.S. 1965, City University of New York, City College, Ph.D. 1969, Syracuse University

Lowell Martin Weiss, *Associate Clinical Professor of Medicine*
B.S. 1957, Rutgers—The State University, M.D. 1962, George Washington University

Michael Aron Weiss, *Associate Clinical Professor of Radiology*
B.A. 1966, University of Rochester; M.D. 1970, New York University

Mark Irwin Weissman, *Assistant Professor of Health Care Sciences and of Child Health and Development*
B.S. 1973, Pennsylvania State University, M.D. 1975, Thomas Jefferson University

Stephen M. Weissman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1963, Yeshiva University

Isaac Weiszer, *Assistant Clinical Professor of Medicine*
B.S. 1956, M.D. 1960, University of Illinois

Leila Greiss Welborn, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., Ch.B. 1967, Cairo University, Egypt

James Lansing Wellhouse, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1948, University of Iowa; M.D. 1952, Washington University

John Richard Wells, Jr., *Adjunct Instructor in Orthopaedic Surgery*
B.S. 1971, Villanova University; M.D. 1977, Georgetown University

Karen Cameron Wells, *Associate Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1974, M.S. 1976, Ph.D. 1978, University of Georgia

Michael Robert Wells, *Assistant Research Professor of Physiology*
B.S. 1973, Ph.D. 1977, University of Florida

Ann Susan Kober Werner, *Assistant Clinical Professor of Child Health and Development*
B.A. 1962, Barnard College; M.D. 1967, Yeshiva University

Mario Werner, *Professor of Pathology (Laboratory Medicine)*
Dr. Med. 1960, University of Zurich, Switzerland

Stephan Lionel Werner, *Clinical Instructor in Urology*
B.A. 1960, Clark University; M.D. 1960, Yeshiva University

Gloria Ruth Werth, *Associate Clinical Professor of Medicine*
A.B. 1949, Goucher College, M.D. 1953, Johns Hopkins University

Raymond B. Wertheim, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1964, Trinity College, Connecticut; M.D. 1969, Temple University

Michael Terry West, *Special Lecturer in Radiology*

Jean Kendrick Weston, *Adjunct Professor of Clinical Engineering*
A.B. 1930, M.S. 1931, University of Michigan; Ph.D. 1933, M.D. 1941, Temple University

Edwin Eugene Westura, *Associate Clinical Professor of Medicine*
B.A. 1952, St. Peter's College, New Jersey, M.D. 1957, Creighton University

Patience Haydock White, *Assistant Professor of Medicine (Rheumatology) and of Child Health and Development*
A.B. 1970, Vassar College, M.S. 1972, Dartmouth College, M.D. 1974, Harvard University

Robert Lawrence White, *Assistant Clinical Professor of Radiology*
B.S. 1967, College of William and Mary; M.D. 1971, University of Virginia

Sno White, *Clinical Instructor in Child Health and Development*
B.S. 1974, Pennsylvania State University; M.D. 1976, Thomas Jefferson University

Paul Vernon Whitmore, *Assistant Clinical Professor of Ophthalmology*
B.S. 1962, M.D. 1966, University of Michigan

Henry Sindos Wicker, *Assistant Clinical Professor of Ophthalmology*
B.S. 1948, Xavier University; M.D. 1953, Howard University

Jerry M. Wiener, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development; Chairman of the Department of Psychiatry and Behavioral Sciences*
M.D. 1956, Baylor University

Sam W. Wiesel, *Associate Professor of Orthopaedic Surgery*
B.A. 1967, Emory University; M.D. 1971, University of Pennsylvania

Donald C. Wilansky, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.Sc. 1946, M.D., C.M. 1950, Dalhousie University, Canada

Donald Phillips Wildsmith, *Adjunct Instructor in Health Care Sciences*

Arthur Joseph Wilets, *Clinical Instructor in Surgery*
B.A. 1943, M.D. 1946, University of Wisconsin

Robert Shaw Wilkinson, *Associate Clinical Professor of Medicine*
B.A. 1950, Dartmouth College; M.D. 1955, New York University

Ann Lottie Barnett Williams, *Assistant Clinical Professor of Medicine*
M.B., B.S. 1965, University of London, England

Irving Cardinal Williams, *Assistant Clinical Professor of Child Health and Development*
B.S. 1954, Morgan State University; M.D. 1964, Howard University

Jerry Randall Williams, *Research Professor of Radiology and of Pharmacology*
B.A. 1957, Texas Christian University; B.Sc., M.Sc. 1960, National University of Ireland; D.Sc. 1972, Harvard University

Marjorie Joan Williams, *Clinical Professor of Pathology*
M.D. 1943, University of Bristol, England

Arnold J. Willis, *Clinical Instructor in Urology*
B.A. 1970, Franklin and Marshall College; M.D. 1974, Thomas Jefferson University

George Henry Willis, *Special Lecturer in Health Care Sciences*

Elliot Charles Wilner, *Assistant Clinical Professor of Neurology*
B.A. 1958, Columbia University; M.D. 1962, George Washington University

Norman Louis Wilson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1959, Yale University; M.D. 1963, Harvard University

James William Winebright, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.A. 1958, Knox College; M.S. 1963, M.D. 1964, University of Chicago

Charles Jack Winfrey, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1968, University of Maryland; M.D. 1972, University of Virginia

John William Winkler, *Assistant Clinical Professor of Medicine*
B.S. 1949, M.D. 1953, Georgetown University

Alan William Winshel, *Assistant Clinical Professor of Obstetrics and Gynecology*
A.B. 1948, Temple University; M.D. 1952, Hahnemann Medical College

Bradley John Winston, *Clinical Instructor in Health Care Sciences*
B.A. 1972, Middlebury College; M.D. 1979, University of Pennsylvania

Karl Wipplinger, *Associate Professor of Medicine*
M.D. 1953, University of Vienna, Austria

Henry M. Wise, Jr., *Clinical Instructor in Surgery*
B.S. 1950, Franklin and Marshall College; M.D. 1954, University of Pennsylvania

James Howard Wise, *Associate Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1963, Adelphi University; M.A. 1965, Ph.D. 1969, George Washington University

Jarrett Michael Wise, *Associate Professor of Health Care Sciences; Assistant Dean, School of Medicine and Health Sciences*
B.S. in A.H.S. 1971, Duke University

Leonard Arthur Wisneski, *Associate Clinical Professor of Medicine*
B.S. 1969, Drexel University; M.D. 1973, Thomas Jefferson University

Philip Witorsch, *Professor of Medicine*
B.A. 1958, M.D. 1962, New York University

Jeffrey Francis Witte, *Assistant Clinical Professor of Orthopaedic Surgery*
A.B. 1963, Georgetown University; M.D. 1967, University of Michigan

Ralph Emil Wittenberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, M.D. 1960, Wayne State University

John Richard Wittenborn, Jr., *Clinical Instructor in Neurology*
A.B. 1969, Rutgers—The State University; M.D. 1973, Washington University

Elma Kahn Wolf, *Adjunct Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1928, University of California, Berkeley

Muriel Ruth Dubrow Wolf, *Associate Professor of Child Health and Development*
B.A. 1957, Smith College; M.D. 1959, Yale University

Stanley Irving Wolf, *Clinical Professor of Child Health and Development*
B.A. 1947, M.D. 1948, Georgetown University

Martin Samuel Wolfe, *Clinical Professor of Medicine*
B.A. 1957, M.D. 1961, Cornell University; D.C.M.T. 1967, London School of Hygiene and Tropical Medicine, England

Frederick William Wolff, *Professor of Medicine*
M.B., B.S. 1946, M.D. 1957, Durham University, England

Mark Gary Wolfman, *Assistant Clinical Professor of Radiology*
A.B. 1967, University of Rochester; M.D. 1971, Case Western Reserve University

Steven Joel Wolin, *Clinical Professor of Psychiatry and Behavioral Sciences and of Medicine*
A.B. 1962, Brown University; M.D. 1966, Yeshiva University

Sylvia Bernice Wood Wooten, *Assistant Clinical Professor of Child Health and Development*
B.S. 1963, Morgan State College; M.D. 1967, Howard University

Henry Harcus Work, *Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1933, Hamilton College; M.D. 1937, Harvard University

Alvin Charles Wyman, *Clinical Professor of Radiology*
B.A. 1939, Cornell University; M.D. 1943, New York University

William Shigeru Yamamoto, *Professor of Clinical Engineering; Chairman of the Department of Clinical Engineering*
A.B. 1945, Park College; M.D. 1949, M.A. 1971, University of Pennsylvania

Raphael Jonathan Yankey, *Lecturer in Medical Technology in Pathology*
B.S. 1968, M.S. 1971, Howard University

Paul George Yessler, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1943, Franklin and Marshall College; M.D. 1946, University of Pennsylvania

Dal Yoo, *Associate Clinical Professor of Medicine*
M.D. 1967, Seoul National University, South Korea

Ira Sanders Young, *Assistant Clinical Professor of Urology*
A.B. 1955, Lafayette College; M.D. 1959, George Washington University

Charles Chua Yu, *Adjunct Assistant Professor of Anesthesiology*
M.D. 1956, University of Santo Tomas, Philippines

George Wei-Kung Yu, *Clinical Instructor in Urology*
B.A. 1969, Macalester College; M.D. 1973, Tufts University

John Sam Zacharia, *Associate Professor of Ophthalmology*
B.S. 1964, M.D. 1968, American University of Beirut, Lebanon

Nieves Maria Zaldivar, *Clinical Instructor in Child Health and Development*
B.S. 1959, Institute of Havana, Cuba; M.D. 1971, City University of New York, Mount Sinai School of Medicine

Charles Joseph Zaloudek, *Assistant Professor of Pathology*
A.B. 1967, University of California, Berkeley; M.D. 1971, Johns Hopkins University

Paul Zamick, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.A. 1952, University of Manitoba, Canada; M.D. 1958, Royal College of Surgeons, Ireland

Anthony Zappala, *Assistant Professorial Lecturer in Psychiatry and Behavioral Sciences*
M.D. 1942, George Washington University

Kenneth Howard Zaslow, *Adjunct Assistant Professor of Ophthalmology*
B.A. 1961, City University of New York, Brooklyn College; M.D. 1973, Albany Medical College

Marion M. Zatz, *Adjunct Associate Professor of Biochemistry*
B.A. 1965, Columbia University; Ph.D. 1970, Cornell University

Bernard Harold Zeavin, *Assistant Clinical Professor of Ophthalmology*
M.D. 1950, University of Manitoba, Canada

Jack Arnold Zeller, *Assistant Professor of Pathology (Laboratory Medicine)*
B.A. 1960, Columbia University; M.D. 1964, New York Medical College

Jared Bruce Zelman, *Adjunct Assistant Professor of Health Care Sciences*
B.S. 1971, University of California, Berkeley; M.D. 1976, University of Panama

Alan Barry Zients, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1959, Dartmouth College; M.D. 1963, New York University

Ernest Michael Zimmerman, *Assistant Clinical Professor of Ophthalmology*
M.D. 1963, University of Toronto, Canada

Hyman Joseph Zimmerman, *Professor of Medicine*
A.B. 1936, University of Rochester; M.A. 1938, M.D. 1942, Stanford University

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, M.S.W. 1953, University of California, Berkeley; Ph.D. 1967, Catholic University of America

Jack Evans Zimmerman, *Professor of Anesthesiology*
B.S. 1960, University of Maryland; M.D. 1964, George Washington University

Lorenz Eugene Zimmerman, *Clinical Professor of Ophthalmology and of Ophthalmic Pathology*
A.B. 1943, M.D. 1945, George Washington University

Mervin Harvey Zimmerman, *Assistant Clinical Professor of Ophthalmology*
M.D. 1959, University of Toronto, Canada

John Zinner, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Amherst College; M.D. 1963, Harvard University

Bernard Charles Zook, *Associate Professor of Pathology (Comparative Pathology)*
B.S. 1962, D.V.M. 1963, Colorado State University

David M. Zwerdling, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1965, Harvard University; J.D. 1969, University of Chicago; M.D. 1975, Yale University



Assistants in Research and Instruction 1982–83

David Edward Adelberg, *Assistant in Orthopaedic Surgery*
B.S. 1975, University of Miami. M.D. 1980, Yale University

Alf Karl Adler, *Assistant in Obstetrics and Gynecology*
B.A. 1976, Washington University. M.D. 1980, George Washington University

Jeffrey Scott Akman, *Assistant in Psychiatry*
B.S. 1977, Duke University. M.D. 1981, George Washington University

Adhid I. Alarif, *Assistant in Medicine*
B.S. 1964, George Washington University; Ph.D. 1969, Georgetown University; M.D. 1979, Case Western Reserve University

Faisal Jabriel Albanna, *Assistant in Neurological Surgery*
M.D. 1978, University of Vienna, Austria

Amer Zeki Al-Juburi, *Assistant in Urology*
M.B.Ch.B. 1968, Baghdad Medical College, Iraq

Israel Alter, *Assistant in Obstetrics and Gynecology*
B.S. 1975, George Washington University; M.D. 1980, Georgetown University

Barry Dean Amos, *Assistant in Anesthesiology*
M.D. 1978, University of Virginia

Duane Claude Anderson, *Assistant in Obstetrics and Gynecology*
B.A. 1976, Southern Missionary College; M.D. 1980, Loma Linda University

David Mark Arenson, *Assistant in Medicine*
M.B.Ch.B. 1977, University of Cape Town, South Africa

Raya Armaly, *Assistant in Ophthalmology*
B.S. 1976, Duke University. M.D. 1980, University of Pittsburgh

James Ybanez Avila, *Assistant in Anesthesiology*
B.A. 1973, Cebu Velez College, Philippines. M.D. 1977, Southwestern University Medical School, Philippines

Charles James Azzam, *Assistant in Neurological Surgery*
M.D. 1979, L'Université Saint Joseph, Beirut

George William Bailey, *Assistant in Psychiatry*
A.B. 1963, Birmingham Southern College. M.D. 1967, University of Alabama

Neal Dana Barnard, *Assistant in Psychiatry*
B.A. 1975, Macalester College; M.D. 1980, George Washington University

Henry F.X. Baron, *Assistant in Pathology*
B.S. 1968, Georgetown University; M.D. 1978, L'Université Catholique de Louvain, Belgium

Lucille Singer Beck, *Assistant in Medicine*
B.A. 1975, Williams College; M.D. 1980, Northwestern University

John Jefferson Bell, *Assistant in Medicine*
B.A. 1976, Williams College; M.D. 1981, Yeshiva University

Ronald William Benfield, *Assistant in Orthopaedic Surgery*
B.S. 1977, Davidson College. M.D. 1981, George Washington University

Robert Anthony Benigno, *Assistant in Medicine*
B.A. 1975, University of Pennsylvania. M.D. 1980, University of Pittsburgh

Bradley H. Bennett, *Assistant in Surgery*
B.S. 1973, Tufts University. M.D. 1977, Georgetown University

Marilyn Berzin, *Assistant in Dermatology*
B.A. 1973, Connecticut College; M.D. 1979, Yeshiva University

Eythor Bjorgvinsson, *Assistant in Radiology*
B.S. 1973, Menntaskolinn vio Tjornina; M.D. 1979, University of Iceland

Eric Louis Bloomfield, *Assistant in Anesthesiology*
B.S. 1976, Tulane University. M.D. 1981, Louisiana State University, New Orleans

David Sprott Boger, *Assistant in Psychiatry*
B.A. 1975, Duke University; M.D. 1979, University of Virginia

Eric M. Bonnem, *Assistant in Medicine*
B.S. 1972, Dickinson College; M.D. 1976, Pennsylvania State University

Bruce Jason Bortnick, *Assistant in Radiology*
B.S. 1975, George Washington University; M.D. 1979, Howard University

Cynthia Eula Boyd, *Assistant in Medicine*
B.A. 1976, University of Colorado; M.D. 1980, George Washington University

John Additon Bradford, *Assistant in Orthopaedic Surgery*
B.A. 1972, Bowdoin College; M.D. 1978, Medical College of Wisconsin

Steven Carl Brady, *Assistant in Psychiatry*
B.A. 1977, Westminster College; M.D. 1981, University of Missouri

Frank Westbrook Braxton, *Assistant in Medicine*
B.A. 1971, M.D. 1975, Temple University

Arthur Martin Brewer, *Assistant in Medicine*
B.A. 1977, Colgate University; M.D. 1981, Washington University

Stephan Barry Brodie, *Assistant in Anesthesiology*
B.A. 1974, M.D. 1980, George Washington University

Richard Allen Bronsteen, *Assistant in Obstetrics and Gynecology*
B.A. 1975, University of Rochester; M.D. 1980, George Washington University

Robert Williams Buchanan, *Assistant in Psychiatry*
B.S. 1976, Lehigh University; M.D. 1980, New Jersey Medical School

Jonca Camille Bull, *Assistant in Ophthalmology*
A.B. 1974, Princeton University; M.D. 1978, Duke University

Glenn Ross Burgess, *Assistant in Medicine*
B.A. 1976, Stanford University; M.D. 1981, George Washington University

Timothy James Burton, *Assistant in Pathology*
B.S. 1973, M.D. 1978, University of Maryland

Nicolas G. Cacciabeve, *Assistant in Pathology*
B.S. 1975, Fairleigh Dickinson University; M.D. 1979, Georgetown University

Claude Gabbe Cadoux, *Assistant in Emergency Medicine*
B.A. 1975, New York University; M.D. 1981, New York Medical College

John Michael Camas, *Assistant in Surgery*
B.S. 1973, University of Notre Dame; M.D. 1977, Thomas Jefferson University

Jorge Luis Campana, *Assistant in Ophthalmology*
B.S. 1977, University of Miami; M.D. 1981, University of Maryland

Mary Jo Cannon, *Assistant in Anesthesiology*
B.A. 1977, George Washington University; M.D. 1981, University of Maryland

Ronald Edward Capstack, *Assistant in Ophthalmology*
B.S. 1970, M.D. 1978, Georgetown University

Carole Caruso, *Assistant in Anesthesiology*
B.S. 1976, M.D. 1980, University of Pittsburgh

Nicholas Eugene Cavitt, *Assistant in Anesthesiology*
B.A. 1972, B.S. 1975, University of Missouri; D.O. 1980, Kansas City College of Osteopathic Medicine

Luis Augusto Cervantes, *Assistant in Neurological Surgery*
M.D. 1976, National University of Mexico

George Chekan, Jr., *Assistant in Anesthesiology*
B.A. 1975, Bucknell University; M.D. 1980, University of Maryland

Corinne Elisabeth de Cholnoky, *Assistant in Obstetrics and Gynecology*
B.A. 1973, M.D. 1979, Harvard University

Terence Louis Chorba, *Assistant in Medicine*
B.A. 1971, Columbia College; B.A. 1975, Oxford University; M.D. 1979, State University of New York at Buffalo

Nancy Claire Clark, *Assistant in Psychiatry*
B.S. 1976, Providence College; M.D. 1980, Georgetown University

Roderick John Clemente, *Assistant in Neurological Surgery*
B.A. 1972, Cornell University; M.D. 1978, University of Rome

Elizabeth Lipton Cobbs, *Assistant in Medicine*
B.A. 1974, Vassar College; M.D. 1981, George Washington University

Richard Edward Coin, *Assistant in Surgery*
B.A. 1975, University of Virginia; M.D. 1979, Eastern Virginia Medical School

Jeffrey Allen Coles, *Assistant in Emergency Medicine*
B.S. 1976, Baylor College; M.D. 1981, University of Arizona

Robert Charles Conklin, *Assistant in Radiology*
B.S. 1973, St. Joseph's University; D.O. 1977, College of Osteopathic Medicine and Surgery, Des Moines

Richard Irving Cooper, *Assistant in Radiology*
B.A. 1973, Clark University; M.D. 1980, University of Connecticut

William Hurlbert Cooper, Jr., *Assistant in Obstetrics and Gynecology*
B.A. 1976, University of Virginia; M.D. 1980, Medical College of Virginia

Anne Haney Cross, *Assistant in Neurology*
B.S. 1976, University of South Alabama; M.D. 1980, University of Alabama

Eduardo Castro Cuison, *Assistant in Thoracic Surgery*
M.D. 1967, University of Santo Tomas, Philippines

Lee Morriss DeLacy, *Assistant in Medicine*
B.S. 1977, Ursinus College; M.D. 1981, Hahnemann Medical College

Dean Anthony Dent, *Assistant in Anesthesiology*
B.A. 1974, Brown University; M.D. 1978, George Washington University

John Vincent DeSimone, *Assistant in Emergency Medicine*
B.S. 1975, Fordham University; M.D. 1980, Georgetown University

Michael Edward DeWitt, *Assistant in Psychiatry*
B.A. 1977, West Virginia Wesleyan College; M.D. 1981, University of Maryland

Paul Edward DiLorenzo, *Assistant in Medicine*
B.S. 1976, Tufts University; M.D. 1980, University of Virginia

Felix Roberto DiPinto, *Assistant in Medicine*
M.D. 1973, National University of Cordoba

Ludvik Rafael Donner, *Assistant in Pathology*
M.D. 1965, Charles University, Czechoslovakia

Andrew J. Dowd, *Assistant in Orthopaedic Surgery*
B.S. 1977, Long Island University; M.D. 1981, State University of New York Downstate Medical Center

Mitchell Bennett Dunn, *Assistant in Medicine*
B.A. 1975, M.D. 1979, Duke University

Michael Lewis Dvorkin, *Assistant in Orthopaedic Surgery*
B.A. 1976, University of Chicago; M.D. 1980, Washington University

Susan Howard Early, *Assistant in Surgery*
B.S. 1974, College of William and Mary; M.D. 1980, George Washington University

Brian Egan, *Assistant in Ophthalmology*
B.A. 1969, State University of New York at Buffalo; M.D. 1981, West Virginia University

David Roy Eisen, *Assistant in Medicine*
B.S. 1975, Tulane University; M.D. 1979, University of Miami

Patricia Darlene Elliott, *Assistant in Obstetrics and Gynecology*
B.A. 1977, Brown University; M.D. 1980, University of Cincinnati

Michael Samuel Epstein, *Assistant in Medicine*
B.A. 1977, University of Colorado; M.D. 1981, New Jersey Medical School

Gary Warren Falk, *Assistant in Medicine*
B.S. 1976, M.D. 1980, University of Rochester

Barbara Arthur Fenton, *Assistant in Medicine*
B.S. 1973, University of North Carolina; M.D. 1981, George Washington University

Katherine Antonia Ferguson, *Assistant in Psychiatry*
A.B. 1968, Sarah Lawrence College; B.S. 1975, University of Washington; M.D. 1979, George Washington University

Gary Stuart Fialk, *Assistant in Surgery*
B.A. 1974, Clark University; M.S.P.H. 1976, Harvard University; M.D. 1981, University of Connecticut

Thomas B. Fleeter, *Assistant in Orthopaedic Surgery*
B.A. 1973, Northwestern University; M.D. 1979, Howard University

Anthony Maurice Fletcher, *Assistant in Medicine*
B.S. 1976, Xavier University; M.D. 1980, University of Cincinnati

Inga L. Fridie, *Assistant in Pathology*
B.A. 1975, Johns Hopkins University; M.D. 1980, University of Maryland

Louis Vincent Gabaldoni, *Assistant in Obstetrics and Gynecology*
B.S. 1973, University of Massachusetts; M.D. 1978, University of Maryland

Larry Ira Galblum, *Assistant in Pathology*
B.S. 1975, George Washington University; M.D. 1979, University of Maryland

Michael Alan Garone, *Assistant in Medicine*
B.S. 1975, Union College; M.D. 1980, Union University

Richard Lowell Gelfand, *Assistant in Medicine*
B.A. 1975, University of Pennsylvania; M.D. 1979, Georgetown University

Jules Geltzeiler, *Assistant in Urology*
M.D. 1979, Hahnemann Medical College

Paul Alan Gertler, *Assistant in Medicine*
B.S. 1974, M.D. 1978, University of Maryland

Mohsen Gharib, *Assistant in Radiology*
B.A. 1966, Dartmouth College; B.M.Sc. 1968, Dartmouth Medical School; M.D. 1970, Harvard University

Naurang Singh Gill, *Assistant in Neurology*
B.S. 1969, Government College, Ludhiana, India; M.B.B.S. 1974, Government Medical College, Amritsar, India

Ronald Patrick Gleason, *Assistant in Pathology*
B.A. 1977, Wichita State University; M.D. 1980, University of Kansas

Deborah Lynn Gofreed, *Assistant in Medicine*
B.S. 1976, Duke University; M.D. 1980, University of Kansas

Robert Louis Gold, *Assistant in Medicine*
B.S. 1973, M.D. 1978, University of Maryland

Sheldon Elliott Goldberg, *Assistant in Medicine*
B.S. 1973, M.D. 1977, Georgetown University

Neil Howard Goldstein, *Assistant in Medicine*
B.A. 1974, Brandeis University; M.D. 1979, University of Massachusetts

Sandra Segel Goldstein, *Assistant in Medicine*
B.A. 1970, George Washington University; M.S. 1972, Columbia University; M.D. 1980, George Washington University

Stafford Samuel Goldstein, *Assistant in Medicine*
B.A. 1972, University of Pennsylvania; M.D. 1976, George Washington University

Douglas Golenbock, *Assistant in Medicine*
B.S. 1975, M.D. 1980, University of Michigan

Mayer Gorbaty, *Assistant in Medicine*
B.A. 1976, Yeshiva University; M.D. 1980, State University of New York Downstate Medical Center

Stephen Matthew Grant, *Assistant in Medicine*
B.A. 1976, Yale University; M.D. 1981, Harvard University

Melvyn Greberman, *Assistant in Radiology*
A.B. 1962, M.S. 1963, University of Pennsylvania; M.D. 1967, Hahnemann Medical College; M.P.H. 1970, Johns Hopkins University

David Charles Gross, *Assistant in Medicine*
B.A. 1974, State University of New York at Binghamton; M.D. 1978, State University of New York Downstate Medical Center

Goldee Hanna Gross, *Assistant in Obstetrics and Gynecology*
B.A. 1973, University of the Pacific; M.S. 1976, San Diego State University; M.D. 1980, Washington University

Harry Tod Grossman, *Assistant in Anesthesiology*
B.A. 1974, Drake University; D.O. 1979, College of Osteopathic Medicine and Surgery

Rita Grover, *Assistant in Anesthesiology*
M.B.B.S. 1977, Lady Hardinge Medical College, India

Andrew George Gunther, *Assistant in Orthopaedic Surgery*
B.A. 1977, American University; M.D. 1981, Union University

Pamela Marie Gurnick, *Assistant in Medicine*
B.S. 1974, M.P.H. 1976, University of California, Berkeley; M.D. 1980, Michigan State University

Elan Chaim Halperin, *Assistant in Medicine*
B.S. 1977, M.D. 1981, George Washington University

Neil Hayes Halvey, *Assistant in Ophthalmology*
A.B. 1976, M.D. 1980, Cornell University

Mitchell Stephen Hamburg, *Assistant in Medicine*
M.D. 1979, University of Kansas

Laura Jane Hanahan, *Assistant in Radiology*
B.S. 1974, M.D. 1978, Stanford University

Rebecca Jayne Hanna, *Assistant in Medicine*
B.A. 1976, Washington and Jefferson College; M.D. 1980, Pennsylvania State University

Pamela Jo Harris, *Assistant in Medicine*
B.A. 1973, University of Michigan; M.D. 1976, Ohio State University

Joseph Andrew Harrison, *Assistant in Medicine*
B.A. 1976, City University of New York, Queens College; M.D. 1979, State University of New York at Buffalo

Susan Marie Hasselquist, *Assistant in Medicine*
B.S. 1974, University of Wisconsin–River Falls; M.D. 1978, University of Wisconsin

Joseph Michael Hayes, *Assistant in Urology*
B.S. 1975, Iona College; M.D. 1979, Georgetown University

Joanne Herrman, *Assistant in Obstetrics and Gynecology*
B.S. 1975, M.D. 1979, University of Pittsburgh

Vincent Ellis Hill, *Assistant in Pathology*
M.D. 1976, Howard University

Howard Coblentz Hines, *Assistant in Dermatology*
B.A. 1973, Western Maryland College; M.D. 1977, University of Maryland

Barbara Ellen Hoeck, *Assistant in Radiology*
B.A. 1972, Bryn Mawr College; M.D. 1978, George Washington University

Frank Loving Holt, Jr., *Assistant in Medicine*
B.S. 1973, Virginia Polytechnic Institute and State University; M.S. 1975, University of Richmond; M.D. 1980, Medical College of Virginia

B. Zane Horowitz, *Assistant in Emergency Medicine*
B.S. 1979, Rensselaer Polytechnic Institute; M.D. 1979, Union University

Sharyn S. Horwitz, *Assistant in Medicine*
B.S. 1972, City University of New York, City College; M.D. 1977, Georgetown University

Barbara Illowsky, *Assistant in Neurology*
S.B. 1975, S.M. 1976, Massachusetts Institute of Technology; M.D. 1980, Columbia University

Nelson Benito Isada, *Assistant in Obstetrics and Gynecology*
M.D. 1978, State University of New York at Buffalo

Kenneth William Jackson, *Assistant in Orthopaedic Surgery*
B.A. 1975, University of Delaware; M.D. 1979, New Jersey Medical School

Jeff Jacobson, *Assistant in Neurological Surgery*
B.A. 1973, University of Rochester; M.D. 1977, George Washington University

Jack Charles Jawitz, *Assistant in Dermatology*
B.S. 1972, University of Maryland; M.D. 1977, State University of New York Downstate Medical Center

Dilip Vishwanath Jeste, *Assistant in Neurology*
M.B.B.S. 1966, Byramjee Jeegeebhoy Medical College, India; M.D. 1970, Gordhandas Sundardas Medical College, India

Rodney Arthur Johnson, *Assistant in Medicine*
A.B. 1972, Princeton University; M.D. 1976, University of Maryland

Wendy S. Jones, *Assistant in Emergency Medicine*
B.S. 1975, University of Massachusetts; M.D. 1980, Georgetown University

Mitchel Allen Kanter, *Assistant in Surgery*
B.S. 1973, Duke University; M.D. 1977, George Washington University

Najmaldin Omer Karim, *Assistant in Neurological Surgery*
M.B.Ch.B. 1973, Mosul Medical College, Iraq

Evelyn Marlene Karson, *Assistant in Obstetrics and Gynecology*
B.A. 1972, University of Pennsylvania; Ph.D. 1977, University of California, Berkeley; M.D. 1981, University of Miami

David A. Kass, *Assistant in Medicine*
B.A. 1975, Harvard University; M.D. 1980, Yale University

Lawrence Alton Katz, *Assistant in Medicine*
A.B. 1975, M.P.H. 1977, Columbia University; M.D. 1981, George Washington University

Helen Ho Kay, *Assistant in Obstetrics and Gynecology*
B.A. 1975, University of Chicago; M.D. 1979, Yale University

Haeng-Shik Kim, *Assistant in Anesthesiology*
M.D. 1974, Seoul National University, Korea

Mark Steven Kipnes, *Assistant in Medicine*
B.S. 1975, Philadelphia College of Textiles and Science; M.D. 1979, Hahnemann Medical College

Mark Elliot Klein, *Assistant in Radiology*
B.S. 1972, Union College; M.D. 1978, State University of New York Downstate Medical Center

James Louis Konigsberg, *Assistant in Medicine*
B.A. 1975, Washington University; M.D. 1981, George Washington University

Ezriel Edward Kornel, *Assistant in Neurological Surgery*
A.B. 1974, Cornell University; M.D. 1978, Rush University

Joseph Benjamin Koscielniak, *Assistant in Orthopaedic Surgery*
B.S. 1975, Alliance College; M.D. 1979, Indiana University

Mitchell Wolfe Krucoff, *Assistant in Medicine*
B.A. 1976, Yale University; M.D. 1980, George Washington University

James Richard Kunec, *Assistant in Orthopaedic Surgery*
B.A. 1974, Johns Hopkins University; M.D. 1978, Georgetown University

Susan Lacks, *Assistant in Medicine*
B.A. 1976, City University of New York, Queens College; M.D. 1979, Duke University

Roland M. LaJoie, *Assistant in Medicine*
B.A. 1970, M.A. 1973, Boston University; M.D. 1979, University of Liège, Belgium

Stephen Andrew Lakner, *Assistant in Obstetrics and Gynecology*
B.S. 1974, M.D. 1980, George Washington University

Jeffrey H. Landau, *Assistant in Urology*
B.A. 1972, George Washington University; M.D. 1978, New York Medical College

Lance Eric Landvater, *Assistant in Surgery*
B.A. 1973, Franklin and Marshall College; M.D. 1977, Wake Forest University

Patricia Elise Lane, *Assistant in Radiology*
B.A. 1971, Carleton College; M.D. 1979, Georgetown University

Roger F. Leonard, *Assistant in Medicine*
B.A. 1970, Yale University; M.D. 1981, University of Hawaii

Bradley Howard Levin, *Assistant in Thoracic Surgery*
B.A. 1972, West Virginia University; M.D. 1976, Wake Forest University

Kenneth Levin, *Assistant in Radiology*
B.S. 1973, Wilkes College; M.D. 1977, Thomas Jefferson University

Michael Sean Lippe, *Assistant in Emergency Medicine*
B.A. 1976, Franklin and Marshall College; M.D. 1980, Pennsylvania State University

Walter P. Lischick, *Assistant in Surgery*
B.S. 1974, M.D. 1979, Georgetown University

Frank Joseph Listello, *Assistant in Medicine*
B.S. 1973, University of Michigan; M.D. 1978, Wayne State University

Samuel Louie, *Assistant in Pathology*
B.A. 1971, Haverford College; M.D. 1975, University of Pennsylvania

Carol Ann Ludolph, *Assistant in Neurological Surgery*
A.B. 1972, Temple University; M.D. 1976, Medical College of Pennsylvania

Eduard Lvovsky, *Assistant in Radiology*
M.D. 1961, Leningrad Medical School of Sanitation and Hygiene, U.S.S.R.; Ph.D. 1967, Central Institute of Radiology, U.S.S.R.

Sergey Lyubsky, *Assistant in Pathology*
M.D. 1978, Moscow Pirogov Medical Institute, U.S.S.R.; Ph.D. 1975, Institute of Human Morphology, U.S.S.R. Academy of Medicine

Adrian Magee, *Assistant in Medicine*
B.S. 1974, University College, Dublin; M.B. 1981, Royal College of Surgeons, Dublin

Susan Leah Maier, *Assistant in Emergency Medicine*
B.A. 1977, University of Rochester; M.D. 1981, City University of New York, Mt. Sinai School of Medicine

Louis Robert Mandris, *Assistant in Surgery*
B.S. 1975, M.D. 1979, University of Maryland

Michael John Manyak, *Assistant in Urology*
B.A. 1973, University of Notre Dame; M.D. 1979, University of the East, Manila

Mollyann Green March, *Assistant in Medicine*
B.A. 1972, Boston University; M.D. 1981, Medical College of Pennsylvania

Thomas Joseph Marcisz, *Assistant in Neurological Surgery*
B.S.M.E. 1964, M.S.M.E. 1965, Ph.D. 1973, M.D. 1981, University of Illinois

John George Mardiat, *Assistant in Radiology*
B.A. 1973, M.D. 1979, University of Missouri–Kansas City

Stephen Douglas Martin, *Assistant in Anesthesiology*
B.A. 1977, M.D. 1981, University of Texas

Kenneth Grant Mason, *Assistant in Surgery*
B.S. 1969, Carroll College; M.D. 1977, Howard University

Reginald Don Mason, *Assistant in Medicine*
B.S. 1977, Stanford University; M.D. 1981, University of California, San Francisco

Robert Israel Massey, Assistant in Anesthesiology
B.S. 1975, University of Georgia; M.D. 1980, University of South Carolina

Cynthia Matossian, *Assistant in Ophthalmology*
B.A. 1976, Ohio Wesleyan University; M.D. 1981, Pennsylvania State University

Merle Clements McCann, *Assistant in Psychiatry*
B.S. 1977, College of William and Mary; M.D. 1981, Medical College of Virginia

Leah Sylvia McCormack, *Assistant in Dermatology*
A.B. 1976, Smith College; M.D. 1980, City University of New York, Mt. Sinai School of Medicine

Lawrence S. McDonald, *Assistant in Medicine*
B.A. 1969, Saint John Fisher College; M.D. 1981, Medical College of Pennsylvania

Judson Chase McGowan, *Assistant in Orthopaedic Surgery*
B.S. 1969, University of Rochester; M.D. 1978, George Washington University

Joan McIlhenny, *Assistant in Radiology*
B.A. 1973, Radcliffe College; M.D. 1977, University of Pennsylvania

Gordon Edwin Melville, *Assistant in Radiology*
B.S.E. 1976, Duke University; M.D. 1980, University of North Carolina

Pedro Ramon Mencia, *Assistant in Obstetrics and Gynecology*
B.A. 1976, Columbia University; M.D. 1981, George Washington University

Beatriz C. Mendez, *Assistant in Obstetrics and Gynecology*
B.S. 1974, M.D. 1979, Pennsylvania State University

Robin Beth Merlino, *Assistant in Medicine*
B.A. 1976, Adelphi University; M.D. 1980, University of Michigan

Mark Anthony Miani, *Assistant in Medicine*
B.S. 1976, Rensselaer Polytechnic Institute; M.D. 1980, Union University

Keith Wilson Michl, *Assistant in Medicine*
A.B. 1977, Middlebury College; M.D. 1981, University of Cincinnati

Hariatmi Kertonadi Miller, *Assistant in Pathology*
M.D. 1976, Airlangga University, Indonesia

Madeline Darlene Miller, *Assistant in Anesthesiology*
B.S. 1974, University of Cincinnati; M.D. 1978, University of Tennessee

Marshall Stuart Millman, *Assistant in Anesthesiology*
B.S., Ph.D. 1966, University of Illinois; M.D. 1981, Autonomous University of Juarez, Mexico

Morris M. Milman, *Assistant in Medicine*
B.A. 1973, State University of New York at Binghamton; M.D. 1980, Union University

Kenneth Victor Miselis, *Assistant in Ophthalmology*
B.S. 1974, Massachusetts Institute of Technology; M.D. 1979, University of Vermont

Donald Gordon Mitchell, *Assistant in Radiology*
B.A. 1977, Brandeis University; M.D. 1981, State University of New York Downstate Medical Center

Marianne Moore, *Assistant in Medicine*
B.S. 1969, M.D. 1979, Loyola University of Chicago

Seth Alexander Morgan, *Assistant in Neurology*
B.A. 1976, Connecticut College; M.D. 1981, George Washington University

Joseph Luis Mosquera, *Assistant in Neurology*
B.S. 1976, Rutgers—The State University; M.D. 1980, Universidad General del Este, Dominican Republic

Patricia Lee Murray, *Assistant in Obstetrics and Gynecology*
B.S. 1976, Wright State University; M.D. 1981, George Washington University

Michael Wills Nabors, *Assistant in Neurological Surgery*
B.A. 1974, M.D. 1979, Case Western Reserve University

Tina Mathias Narayan, *Assistant in Neurology*
M.B.B.S. 1979, Christian Medical College, India

Margaret Havens Neal, *Assistant in Pathology*
B.S. 1977, M.D. 1981, West Virginia University

Kenneth Michael Nechin, *Assistant in Medicine*
B.A. 1974, University of Denver; M.D. 1981, George Washington University

Richard Lawrence Needleman, *Assistant in Orthopaedic Surgery*
B.S. 1975, University of Michigan; M.D. 1979, University of Vermont

Alan B. Ney, *Assistant in Radiology*
B.S. 1971, St. Lawrence University; M.D. 1975, George Washington University

Mike Monahan Nichols, *Assistant in Orthopaedic Surgery*
B.A. 1972, University of Kansas; M.D. 1981, Loyola University of Chicago

Dorothy Mary Nicholson, *Assistant in Medicine*
B.A. 1976, Bryn Mawr College; M.D. 1981, Brown University

Jay Ira Novetsky, *Assistant in Ophthalmology*
B.S. 1975, University of Michigan—Dearborn; M.D. 1979, Wayne State University

John Sebastian O'Brien II, *Assistant in Psychiatry*
B.A. 1975, University of Delaware; M.D. 1979, Thomas Jefferson University

Gerard S. O'Connor, *Assistant in Surgery*
B.S. 1973, M.D. 1975, Georgetown University

Margaret Rose O'Leary, *Assistant in Emergency Medicine*
A.B. 1974, Smith College; A.B. 1976, University of California, Berkeley; M.D. 1980, George Washington University

Gregory Chet Oliver, *Assistant in Surgery*
B.A. 1972, Colgate University; M.D. 1976, George Washington University

Thomas Donald Olsavsky, *Assistant in Radiology*
B.S. 1977, Georgetown University; M.D. 1981, University of Connecticut

William James O'Neill, *Assistant in Surgery*
B.S. 1972, Tulane University; M.D. 1980, George Washington University

Eric Alfred Oristian, *Assistant in Surgery*
B.S. 1974, Duke University; M.D. 1978, George Washington University

Thomas Glenn Pait, *Assistant in Neurological Surgery*
B.S. 1973, University of Florida; M.D. 1981, George Washington University

Quisqueya T. Palacios, *Assistant in Anesthesiology*
B.A. 1976, Mount Holyoke College; M.D. 1980, Universidad Autonomous de Guadalajara, Mexico

Alicja Marta Pauler, *Assistant in Physical Medicine and Rehabilitation*
M.D. 1967, The Silesian University of Medicine, Poland

Arthur Earl Perpall, *Assistant in Emergency Medicine*
B.A. 1973, Boston University; M.D. 1977, Howard University

Michael Howard Phillips, *Assistant in Surgery*
B.A. 1974, Washington University; M.D. 1979, University of Colorado

Donna Marie Pittman, *Assistant in Surgery*
B.S. 1975, George Washington University; M.D. 1979, Georgetown University

Michael Alan Polis, *Assistant in Medicine*
B.S. 1976, Yale University; M.D. 1980, Yeshiva University

Richard Gary Popiel, *Assistant in Medicine*
B.S. 1975, M.D. 1981, George Washington University

Stephen William Pournaras, *Assistant in Orthopaedic Surgery*
B.S. 1975, M.D. 1980, University of Virginia

William Melvin Price, *Assistant in Orthopaedic Surgery*
A.B. 1975, M.D. 1979, St. Louis University

Larry Jan Quate, *Assistant in Medicine*
D.M.D. 1976, M.D. 1980, University of Pennsylvania

Concepcion Aglipay Regacho, *Assistant in Anesthesiology*
B.S. 1969, M.D. 1973, University of Santo Tomas, Philippines

Gerald Robert Renzi, *Assistant in Obstetrics and Gynecology*
B.S. 1976, Georgetown University; M.D. 1980, Howard University

Robert Philip Ringler, *Assistant in Medicine*
A.B. 1977, Dartmouth College; M.D. 1981, George Washington University

John Hahn Roberts, *Assistant in Medicine*
B.A. 1975, Johns Hopkins University; M.D. 1980, Temple University

Michael David Robinson, *Assistant in Psychiatry*
A.B. 1975, Harvard University; M.D. 1979, Johns Hopkins University

William J. Rodman, *Assistant in Surgery*
B.S. 1974, Mount Union College; M.D. 1980, George Washington University

Lisa Sharon Rome, *Assistant in Medicine*
B.A., M.Ed. 1975, Tufts University; M.D. 1980, Union University

Steven James Rooney, *Assistant in Radiology*
B.S. 1975, Lafayette College; M.D. 1979, Thomas Jefferson University

Melissa Leonor Rosado, *Assistant in Radiology*
B.A. 1976, Johns Hopkins University; M.D. 1980, Uniformed Services University of the Health Sciences

Jeffrey Louis Roth, *Assistant in Anesthesiology*
B.S. 1971, M.D. 1978, University of Miami

Peter Gordon Rothschild, *Assistant in Obstetrics and Gynecology*
B.S. 1977, M.D. 1981, George Washington University

Robin Debra Rothstein, *Assistant in Medicine*
B.A. 1977, Lehigh University; M.D. 1981, Medical College of Pennsylvania

William Frederick Ruppel, *Assistant in Radiology*
B.S. 1969, University of Michigan; M.D. 1976, University of Maryland

Catherine Hyde Ryan, *Assistant in Medicine*
A.B. 1974, Cornell University; M.D. 1979, Washington University

Howard Alan Sachs, *Assistant in Radiology*
B.A. 1977, Duke University; M.D. 1980, University of South Florida

Alan Jeffrey Sacks, *Assistant in Obstetrics and Gynecology*
B.S. 1975, Emory University; M.D. 1980, University of Maryland

William Michael Sacks, *Assistant in Radiology*
B.A. 1959, Rice University; Ph.D. 1966, Harvard University; M.D. 1979, University of Connecticut

Justin Louis Salerno, *Assistant in Obstetrics and Gynecology*
B.S. 1976, Syracuse University; M.D. 1980, New York Medical College

Robert Louis Salerno, *Assistant in Obstetrics and Gynecology*
B.A. 1972, University of California; M.A. 1973, Columbia University; Ph.D. 1977, Fordham University; M.D. 1981, New York Medical College

Daniel Howard Saltzman, *Assistant in Obstetrics and Gynecology*
B.S. 1975, State University of New York at Stony Brook; M.D. 1979, State University of New York at Buffalo

Carol Salzman, *Assistant in Medicine*
B.A. 1975, Hampshire College; M.D. 1981, Georgetown University

Raj Bhagwan Samtani, *Assistant in Medicine*
M.B.B.S. 1975, Bombay University, India

Jeffrey Ross Sandler, *Assistant in Ophthalmology*
B.A. 1976, Cornell University; M.D. 1981, George Washington University

Robert Joseph Santone, *Assistant in Anesthesiology*
B.S. 1974, Fairfield University; M.D. 1980, University of Connecticut

Mohammadali Sarshar, *Assistant in Radiology*
M.D. 1969, Tehran University, Iran

Noriko Sato, *Assistant in Pathology*
B.S. 1959, M.D. 1963, Hokkaido University, Japan

Erminia Sciumbata Scarcella, *Assistant in Psychiatry*
M.D. 1970, University of Rome, Italy

Drew F. Scheele, *Assistant in Emergency Medicine*
B.S. 1970, University of Virginia, M.D. 1980, George Washington University

Stanley Burnett Schmidt, *Assistant in Medicine*
B.A. 1975, M.D. 1979, University of Virginia

Harry Schwartz, *Assistant in Medicine*
B.S. 1974, City University of New York, Brooklyn College, M.D. 1978, Medical College of Wisconsin

Michael Jay Schwartz, *Assistant in Medicine*
B.A. 1973, Harvard University, M.D. 1977, University of Rochester

Philip Jay Schwartz, *Assistant in Medicine*
B.S. 1974, University of Pittsburgh, M.D. 1978, Pennsylvania State University

John Michel Shamma'a, *Assistant in Medicine*
B.S. 1975, American University of Beirut, M.D. 1978, Emory University

Steven M. Sharpe, *Assistant in Intensive Care Medicine*
B.C.S. 1972, University of Michigan, M.D. 1979, Tufts University

Suzanne Moore Shepherd, *Assistant in Emergency Medicine*
B.A. 1974, Goucher College, M.S. 1976, M.D. 1980, Georgetown University

Reed M. Shnider, *Assistant in Medicine*
B.S. 1976, Hebrew University, Israel, M.D. 1980, Georgetown University

Sandy Warren Shultz, *Assistant in Radiology*
B.S. 1975, M.D. 1981, George Washington University

Mary Khayat Sidawy, *Assistant in Pathology*
M.D. 1978, Aleppo University, Syria

Susan Helen Siegel, *Assistant in Anesthesiology*
B.S. 1976, M.D. 1981, University of Maryland

Jeffrey Mark Silberberg, *Assistant in Medicine*
B.S. 1974, City University of New York, Brooklyn College, M.D. 1978, New York University

Mark Alan Silver, *Assistant in Medicine*
B.S. 1975, University of Michigan, M.D. 1979, University of Pennsylvania

Jarema John Skirnyk, *Assistant in Anesthesiology*
B.A. 1973, M.S. 1974, Northwestern University, M.D. 1980, Autonomous University of Guadalajara

Jean Wheeler Smith, *Assistant in Psychiatry*
B.S. 1965, Howard University, M.S. 1970, University of Maryland, M.D. 1980, George Washington University

Jeffrey Paul Smith, *Assistant in Emergency Medicine*
B.S. 1977, Villanova University, M.D. 1981, University of Maryland

Alexis Bohdan Sokil, *Assistant in Medicine*
A.B. 1974, Cornell University, M.D. 1978, University of Maryland

Edward Harvey Stolar, *Assistant in Dermatology*
B.A. 1976, University of Rochester, M.D. 1981, George Washington University

Stephen Alan Stowers, *Assistant in Medicine*
B.A. 1973, University of Richmond, M.D. 1978, University of Virginia

Clyde Arthur Strang, *Assistant in Urology*
B.A. 1973, Hood College, M.D. 1977, University of Maryland

Calvin Russell Sumner, *Assistant in Psychiatry*
B.A. 1971, M.A. 1973, Columbia University, M.D. 1981, George Washington University

Louis W. Swann, *Assistant in Anesthesiology*
B.S.E. 1972, Tulane University, M.D. 1981, University of South Alabama

Jonathan Mark Sykes, *Assistant in Surgery*
B.A. 1977, University of Pennsylvania; M.D. 1981, George Washington University

Ana Szarfman, *Assistant in Pathology*
M.D. 1965, University of Buenos Aires, Argentina

Hunter Scott Tashman, *Assistant in Obstetrics and Gynecology*
B.S. 1973, State University of New York at Stony Brook; M.D. 1980, State University of New York Downstate Medical Center

Joseph Bernard Taylor, *Assistant in Medicine*
B.S. 1975, Boston College; M.D. 1979, Boston University

Steven Teich, *Assistant in Surgery*
B.S., M.S., 1977, Rensselaer Polytechnic Institute; M.D. 1981, State University of New York at Buffalo

Deborah C. ter Meulen, *Assistant in Radiology*
B.A. 1976, Mount Holyoke College; M.D. 1980, Boston University

Thomas Anthony Tesoriero, *Assistant in Medicine*
B.A. 1977, Rutgers—The State University; M.D. 1981, University of Rochester

Candace Sharon Thurston, *Assistant in Obstetrics and Gynecology*
B.A. 1968, Howard University; M.D. 1979, Yale University

Martin Stanley Topiel, *Assistant in Medicine*
B.A. 1975, University of Rochester; M.D. 1979, New York University

James Leo Torrens, *Assistant in Surgery*
B.A. 1975, Johns Hopkins University; M.D. 1979, Georgetown University

William Drew Trainor, *Assistant in Medicine*
A.B. 1969, M.D. 1975, Georgetown University

Mary V. Tsourmas, *Assistant in Pathology*
B.A. 1974, West Virginia University; M.D. 1978, Georgetown University

Nicholas F. Tsourmas, *Assistant in Orthopaedic Surgery*
B.A. 1973, Northwestern University; M.D. 1978, Georgetown University

Michael Nam-Hung Tsun, *Assistant in Medicine*
B.S. 1975, M.D. 1979, Georgetown University

Steven Michael Tucci, *Assistant in Physical Medicine and Rehabilitation*
B.S. 1971, Manhattan College; M.S. 1977, State University of New York; Ph.D. 1978; M.D. 1981, Union University

Paul Adrian Tudder, *Assistant in Obstetrics and Gynecology*
B.A. 1973, Temple University; M.D. 1978, Autonomous University of Guadalajara, Mexico

Brian Charles Turrisi, *Assistant in Medicine*
B.A. 1974, Holy Cross College; M.D. 1978, Georgetown University

Robin Marianne Ulanow, *Assistant in Surgery*
A.B. 1974, Smith College; M.D. 1978, University of Maryland

James Christos Vailas, *Assistant in Surgery*
B.A. 1978, M.D. 1981, Dartmouth College

Judith M. Veihmeyer, *Assistant in Anesthesiology*
B.S. 1977, University of Maryland; M.D. 1981, University of South Florida

Claudio Enrique Vincenty, *Assistant in Anesthesiology*
M.D. 1981, Universidad del Caribe Cayey, Puerto Rico

Lam Vien Vinh, *Assistant in Surgery*
M.D. 1976, Université Libre de Bruxelles

Stephen Rieke Voss, *Assistant in Medicine*
B.A. 1975, University of Pennsylvania; M.D. 1979, University of California, Los Angeles

Marilyn Mills Walkey, *Assistant in Radiology*
B.A. 1972, Pomona College; M.S. 1974, San Francisco State University; M.D. 1979, Union University

Gary Steven Wand, *Assistant in Medicine*
B.A. 1975, Skidmore College; M.D. 1980, George Washington University

Elaine Petigura Wang, *Assistant in Pathology*
M.B.B.S. 1972, Hong Kong University

Christine Ann Wanke, *Assistant in Medicine*
B.A. 1976, M.D. 1980, University of Wisconsin

Daniel R. Weinberger, *Assistant in Neurology*
B.A. 1969, Johns Hopkins University; M.D. 1973, University of Pennsylvania

Michael Lee Weinstein, *Assistant in Medicine*
B.S. 1976, M.D. 1980, Northwestern University

Richard Carl Weiss, *Assistant in Medicine*
B.A. 1973, University of Rochester; M.D. 1979, Hahnemann Medical College

John Franklin Williams, Jr., *Assistant in Intensive Care Medicine*
A.B. 1970, Boston University; M.P.H. 1975, Yale University; M.D. 1979, George Washington University

Steven Ross Wilner, *Assistant in Medicine*
B.A. 1976, University of Colorado; M.D. 1980, University of Oklahoma

Jeffrey Philip Winick, *Assistant in Ophthalmology*
B.A. 1975, Brandeis University; M.D. 1979, Cornell University

Fred Steven Wittenstein, *Assistant in Radiology*
B.A. 1976, M.D. 1980, Pennsylvania State University

Wende Jean Wood, *Assistant in Medicine*
B.S. 1975, University of Washington; M.D. 1981, George Washington University

John Milton Yackee, *Assistant in Medicine*
B.A. 1975, Ithaca College; M.D. 1980, George Washington University

Mostafa Galal Zakaria, *Assistant in Anesthesiology*
M.B.Ch.B. 1975, Alexandria University, Egypt

Stefan H. Zineski, *Assistant in Medicine*
B.A. 1971, M.D. 1975, Wayne State University

Paul Edward Zorsky, *Assistant in Medicine*
B.S. 1972, M.D. 1978, University of Connecticut

Richard Matthew Zweig, *Assistant in Neurology*
B.A. 1974, M.D. 1978, Case Western Reserve University

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National Law Center, Admissions Office, National Law Center

School of Medicine and Health Sciences, Admissions Office, School of Medicine and Health Sciences

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Schedule of Classes—Off Campus, Fall, Spring, and Summer, Division of Continuing Education and Summer Sessions

Schedule of Classes, Summer Sessions, Summer Sessions Office

The George Washington University

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Graduate School of Arts and Sciences, 1893

School of Medicine and Health Sciences, 1825

National Law Center, 1865

School of Engineering and Applied Science, 1884

School of Education and Human Development, 1907

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Division of Experimental Programs, 1973

Colleges and Schools—Degree Programs

Columbian College of Arts and Sciences: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Music (B.Mus.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart.Sc.), and Bachelor of Science in Geodesy (B.S. in Geod.)

Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

National Law Center: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) [M.Comp.L. (Am.Prac.)], and Doctor of Juridical Science (S.J.D.)

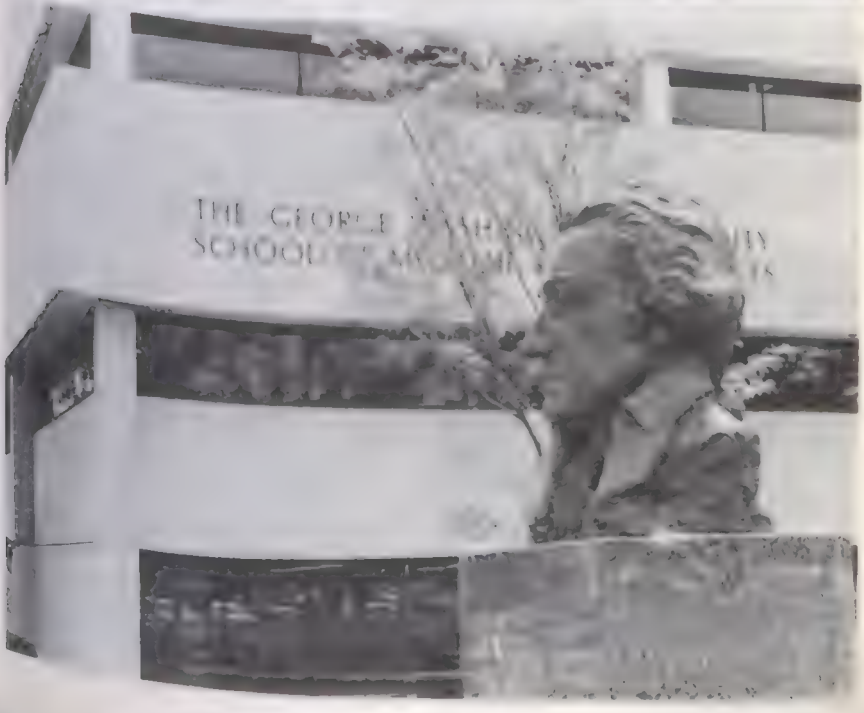
School of Engineering and Applied Science: Bachelor of Science (Civil Engineering) [B.S. (C.E.)], Bachelor of Science (Computer Science) [B.S. (C.S.)], Bachelor of Science (Electrical Engineering) [B.S. (E.E.)], Bachelor of Science (Mechanical Engineering) [B.S. (M.E.)] Bachelor of Science (Operations Research and Computational Science) [B.S. (O.R.&C.S.)], Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Doctor of Science (D.Sc.), Engineer (Engr.), and Applied Scientist (App.Sc.)

School of Education and Human Development: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

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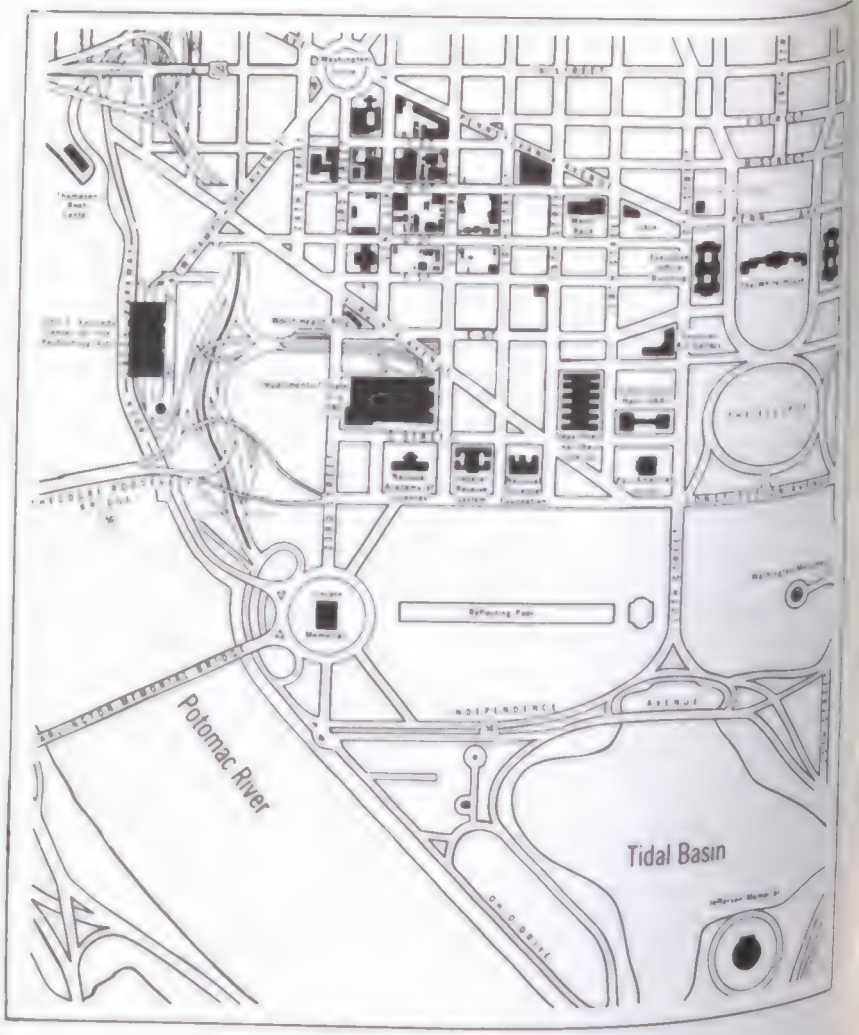




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NATIONAL LAW CENTER BULLETIN

1983-1984





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TO PROSPECTIVE STUDENTS

This Bulletin of the George Washington University National Law Center contains general information about such matters as admission, registration, fees, and financial aid, as well as a listing of our faculty and courses of instruction. We are one of the nation's large law schools. But, nonetheless, there always has been a tradition of friendliness among our students and an attitude of accessibility on the part of our faculty. If you join us as first-year students, you will discover that the first-year life of the school is an intense one. Each of the sections into which the first-year class is divided becomes a little community of its own with a camaraderie and _esprit de corps_ which will make that first year one of the most vivid of your lives.

The National Law Center is an institution that is characterized by the richness and diversity of its programs. Whether you are joining us as a J.D. student or an LL.M. student, your time here will be one of intellectual growth. In your upper-class years, you may choose to take one of the many courses and programs in fields such as Constitutional Rights, Administrative Law, Environmental Law, Government Contracts, International Law, Labor Law and Antitrust Law, Land Development Law, Patent Law, or Taxation, which have given this school its reputation as a center for study and research in public law. If you come to us as a graduate student you may choose to specialize in one of the areas just mentioned. As J.D. students in your upper-class years, you might also choose to direct your energies to the School's varied and intense programs in Clinical Law. The class entering The National Law Center in the fall of 1983 should find its years here particularly memorable. A $16.7 million expansion program of the physical facilities of The National Law Center is presently under way. The program encompasses a major renovation of Stockton Hall and the Jacob Burns Law Library, tying them to an impressive new classroom building replacing Bacon Hall to the north and a handsome addition to the Law Library to the south.

As is evident, The National Law Center is a large and dynamic place, but we believe it is a community. We hope that you will aspire to join us and become a part of that community.

Jerome A. Barron
Dean

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1983	**SUMMER TERM**	
May 23	Registration for all sessions *Monday* (noon–6:30 p.m.)	
	Application for September graduation due as part of registration	
	First-session and 13-week session classes begin	
May 30	Holiday *Monday*	
July 1	First-session classes end *Friday*	
July 4	Holiday *Monday*	
July 5–7	First-session examination period *Tuesday–Thursday*	
July 8	Registration *Friday* (9:30 a.m.–2 p.m. and 4–6 p.m.)	
	Application for September graduation due as part of registration	
	Second-session classes begin	
August 16	Last day of classes *Tuesday*	
August 17–19	Second-session and 13-week session examination period *Wednesday–Friday*	

* The Academic Calendar is subject to change

1983 FALL SEMESTER

August 18–19 Registration *Thursday* (12:30–7 p.m.) and *Friday* (3–7 p.m.)
Application for February graduation due as part of registration
August 22 Classes begin *Monday*
September 5 Labor Day (holiday) *Monday*
October 7 S.J.D. dissertations of February candidates due *Friday*
November 23 Thanksgiving recess begins after last class *Wednesday*
November 28 Classes resume *Monday*
December 2 Last day of fall-semester classes *Friday*
LL.M. theses of February candidates due
December 3–16 Reading and examination period

1984 SPRING SEMESTER

January 5–6 Registration *Thursday* (12:30–7 p.m.) and *Friday* (3–7 p.m.)
Application for May graduation due as part of registration
January 9 Classes begin *Monday*
January 27 S.J.D. dissertations of May candidates due *Friday*
February 20 Winter Convocation (holiday) *Monday*
March 1 Completed applications for 1984–1985 teaching fellowships due *Thursday*
March 17 Spring recess begins after last class *Saturday*
March 26 Classes resume *Monday*
April 27 LL.M. theses of May candidates due *Friday*
Last day of spring-semester classes *Friday*
April 28–May 11 Reading and examination period
May 20 Commencement *Sunday*

JACOB BURNS LAW LIBRARY
THE GEORGE WASHINGTON
UNIVERSITY

THE NATIONAL LAW CENTER

HISTORY

The Law Center, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty that reflected the fact that it was at the seat of our nation's government. Associate Justices David J. Brewer and John Marshall Harlan of the Supreme Court of the United States were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, National University School of Law, which had an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. At present these include Taxation; Labor Law; Environmental and Energy Law; Patent Law; International and Comparative Law; and Government Contracts. The academic courses reflect the breadth in public law for which the Law Center is well known.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law program has been developed which is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the Community Legal Clinic, Clinical Studies in Environmental Law, Students in Court, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, taxation and government contracts, has developed a rich selection of courses, traditional and clinical, oriented toward the needs of the poor, the elderly, and the consumer.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, DC 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in the nation's capital, the focal point of the law in action, both American and international. The work of the Center goes on in this environment, presenting a unique opportunity for observation and study of federal agencies—judicial, legislative, and administrative. Readily accessible are the Supreme Court of the United States, the federal trial and appellate courts of the District of Columbia, and, in addition, federal courts of special jurisdiction, such as the United States Court of Claims, the United States Court of Customs and Patent Appeals, the United States Tax Court and the Court of Military Appeals. Current federal legislation can be studied as it is considered by Congressional committees and as it comes up for debate on the floors of the House of Representatives and the Senate. With respect to the federal administrative agencies, students here in Washington have matchless opportunities for study and observation. They can attend informal and formal hearings of these agencies and can obtain from the docket sections complete records of administrative adjudication in specific cases. Illustrative of such federal agencies are the Interstate Commerce Commission and the Civil Aeronautics Board in the field of transportation; the Federal Trade Commission in the field of trade regulation; the Securities and Exchange Commission in the field of security issues and corporate finance; the National Labor Relations Board in the field of labor-management relations; the United States Patent Office in the field of patent law; the Federal Power Commission in the field of water, natural gas, and electric power; and the Federal Communications Commission in the field of radio and television.

Supplementing these environmental advantages of law in action are the exceptional research library collections in the Library of Congress, in the various departments of the federal government, and in the libraries of the headquarters of national and international organizations. The notable library of the Carnegie Foundation for International Peace has been acquired by George Washington University for use of research students in international and comparative law fields with respect to which Washington has come to be called "The Capital of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence, the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

ENRICHMENT PROGRAM

The Law Center supplements and enriches its diverse law programs by bringing to the school eminent legal scholars, judges, distinguished members of the bar, members of Congress, and high-level government officials to offer lectures and informal seminars with students and faculty. Last year participants in the enrichment program included Ambassador Elliot Richardson, Wade H. McCree, Jr., former Sixth Circuit Court of Appeals Judge and Solicitor General; and Lloyd N. Cutler, former counsel to President Carter. The enrichment program, funded largely by gifts from alumni and friends of the Law Center, includes several endowed lectureships and a visiting scholar program.

OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors, (2) an extensive clinical law program in which students learn legal skills by actual practice, (3) two law journals which specialize in public law and international law, (4) trial practice, (5) participation in the Van Vleck Appellate Case Club and several other moot court competitions; (6) a series of student professional co-curricular activities, (7) studies on an advanced level for foreign as well as for American students, (8) a continuing legal education program for members of the bar, providing them with opportunities for course work within the curriculum; and (9) scholarly research and writing in the law.

THE NATIONAL LAW CENTER COMPLEX

The National Law Center complex presently includes Stockton Hall, Stuart Hall, and the Jacob Burns Law Library.

Stockton Hall

Stockton Hall is the main classroom building; the new classroom building will be on its north side. Stockton Hall also holds faculty offices, the offices of the Dean and the Associate Dean of the Law Center, the Records Office, and student lounges.

Stuart Hall

While construction on the Law Center expansion is taking place, Stuart Hall provides temporary housing for faculty offices, student lounges, the *George Washington Law Review* Office, the Admissions Office, the Career Development Office, the offices of the *Journal of International Law and Economics*, the Black American Law Student Association, the Van Vleck Appellate Case Club, the *Advocate* (the law school newspaper), the Student Bar Association, and Movimiento Legal Latino.

The Jacob Burns Law Library

The Law Library of approximately 300,000 volumes, including microfilm holdings, is housed in the original Jacob Burns Law Library Building, adjoining Stockton Hall on its south side. The Law Library is being extended and a new building is

being added on its south side. Presently the Library comprises nine floor and deck levels with about 49,000 square feet of floor space. Its shelf capacity accommodates over 185,000 volumes; with supplementary shelving in Stockton Hall, a small branch of the Law Library for the use of the *Law Review* in Stuart Hall and substantial storage space in Lisner Hall, the library provides space for approximately 300,000 volumes. Seating for more than 500 readers is provided in four reading rooms, lounge areas, carrels, enclosed study cubicles, semi-private reading alcoves, and seminar rooms.

The collections comprise a comprehensive working library of Anglo-American law, with supplementary material in related disciplines (such as business finance, labor relations, sociology, criminology, political science, biography foreign affairs, and others). Special areas are maintained for collections in tax law labor law, patent-trademark-copyright law, international law, and foreign and comparative law. Included in the collections are the appellate decisions of all state courts and decisions of the federal courts, with comprehensive collections of English and Canadian court decisions; the currently annotated statutes of the 50 states; all federal statutes; English and Canadian statutes; selected statutes of other nations; and an extensive periodical collection, kept current by approximately 1,500 subscriptions, covering virtually all American legal periodicals and most of those published in English throughout the world. The library is strong in its treatise holdings, administrative and regulatory materials, and Congressional coverage. The growing international law holdings include collections of United Nations and European Economic Community printed material, all recent material from the International Labor Organization, and current and retrospective collections of international treaties. A large portion of the holdings of the former library of the Carnegie Endowment for International Peace, acquired by the University in 1950, is in the Law Library. Both LEXIS and WESTLAW, computer-assisted research systems, are available for students and faculty. The Law Library is in the process of enlarging its videotape library to assist in Law Center instruction.

THE JURIS DOCTOR DEGREE PROGRAM

ENTRANCE REQUIREMENTS

For information on application for admission to the Juris Doctor degree program see Admission under General Information. Admission to candidacy for the degree of Juris Doctor requires a Bachelor of Arts or equivalent degree from an accredited college or university, a satisfactory quality of work, and an acceptable distribution of courses. Any substantial number of hours taken on a pass-fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law School Admission Test. Personal recommendations by the faculty, as well as the benefits the school derives from social, ethnic, cultural and geographical diversity among its students, are considered. No applicant will be acceptable in transfer who is ineligible to return in good standing to a previously attended law school. From the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Admissions Office of the National Law Center or from the Law School Admission Services, Box 2000, Newtown, Pa. 18940. The test is administered at





various centers in the United States. Testing dates are usually in October, December, February, and June. Completed application forms and fees must be received by the Law School Admission Services at least four weeks before the date of the test. It is not necessary that formal application for admission be made prior to taking the test.

Advanced Standing

In unusual circumstances, advanced standing toward the degree of Juris Doctor may be granted for work of high quality successfully completed in other law schools that are members of the Association of American Law Schools or are approved by the American Bar Association. Transferred credits will not be recognized in excess of those which might be earned in a similar period in the National Law Center.

Advanced standing will not be granted for law work already counted toward the Bachelor of Arts or other pre-legal degree.

TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the degree of Juris Doctor must submit a tuition deposit ($100 initially plus $350 later) after receipt of notification of acceptance. This deposit is credited toward tuition.

PROFILE OF THE ENTERING CLASS, FALL 1982

A first-year class of approximately 450 students was selected from over 6,000 applicants from 750 colleges and universities. Applications were received from every state in the union. Forty-two percent of the first-year class were women.

The following colleges and universities are each represented by three or more members of the first-year class: American University, Boston College, Brandeis University, Brigham Young University, Bucknell University, College of the Holy Cross, College of William and Mary, Cornell University, Dartmouth College, Dickinson College, Emory University, Franklin and Marshall College, Georgetown University, George Washington University, Harvard University, Johns Hopkins University, Lehigh University, Middlebury College, Northwestern University, Pennsylvania State University, Rutgers—The State University, Scripps College, Smith College, State University of New York at Albany, State University of New York at Binghamton, State University of New York College at Oneonta, State University of New York at Stony Brook, Syracuse University, Trinity College, Tufts University, Tulane University, United States Naval Academy, University of California at Los Angeles, University of Colorado, University of Florida, University of Hawaii, University of Illinois, University of Maryland, University of Massachusetts, University of Miami, University of Michigan, University of Minnesota, University of Notre Dame, University of Pennsylvania, University of Rochester, University of Virginia, University of Washington, University of Wisconsin, Washington University, Wellesley College, Wesleyan University.

THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offers the candidate one of the largest and most varied selections of courses in the country. First-year students are required to take Civil Procedure; Constitutional Law; Contracts; Criminal Law and Procedure; Legal Research and Writing; Moot

Court; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Evidence and Professional Responsibility and Ethics and must fulfill a two-credit legal writing requirement.

Beginning in the fall of 1983, all entering first-year students are required to take one of the following legal perspective courses during their program of study: American Legal History; Comparative Labor Law Seminar; Comparative Law; The Crime Lab, the Forensic Scientist, and the Criminal Lawyer; Jurisprudence; Law and Criminology I or II; Law and Medicine; Law and Psychiatry; The Legal Process; Science and the Legal Process; United Nations Law and World Order.

Beyond these requirements students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own program of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of the spring semester also.

DAY DIVISION

First Year

Fall Semester		Spring Semester	
Contracts I	4	Contracts II	2
Torts	4	Property	4
Criminal Law and Procedure	4	Constitutional Law	4
Legal Research and Writing	2	Civil Procedure	4
		Moot Court	1
Total semester hours	14	Total semester hours	15*

Second Year

Fall Semester		Spring Semester	
Elective	14	Evidence	4
		Elective	10
Total semester hours	14	Total semester hours	14

Third Year

Fall Semester		Spring Semester	
Elective	12	Elective	14
†Legal writing requirement	2		
Total semester hours	14	Total semester hours	14

Professional Responsibility Requirement

‡Professional Responsibility and Ethics	1

* Students may elect to take 13 hours in one of their upper-class semesters.

† This requirement may be satisfied by service on the *Law Review*, by service as an editor of the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that require a research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law 344 *Legal Writing*.

‡ Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second or third year.

EVENING DIVISION

First Year

Fall Semester		Spring Semester	
Contracts I	4	Contracts II	2
Torts	4	Criminal Law and Procedure	4
Legal Research and Writing	2	Civil Procedure	4
Total semester hours	10	Total semester hours	10

Second Year

Fall Semester		Spring Semester	
Property	4	Constitutional Law	4
Elective	6	Moot Court	1
		Elective	5
Total semester hours	10	Total semester hours	10

Third Year

Fall Semester		Spring Semester	
Elective	8	Evidence	4
•Legal writing requirement	2	Elective	6
Total semester hours	10	Total semester hours	10

Fourth Year

Fall Semester		Spring Semester	
Elective	10	Elective	10
Total semester hours	10	Total semester hours	10

Professional Responsibility Requirement

† Professional Responsibility and Ethics	1

Summer Term or Ninth Semester

Elective	4

REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses, with a cumulative average of at least 65. At least two academic years of residence and 56 semester hours are required of students admitted with advanced standing. A student must be registered at the National Law Center for the final semester or summer session preceding graduation. Credits allowed for advanced standing are not included in computing the average required for graduation.

• This requirement may be satisfied by service on the *Law Review*, by service as an editor of the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that require a research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law 391, *Legal Writing*.

† Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second, third, or fourth year.

Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance in the day division for the fall and spring semesters constitutes residence for an academic year; similar attendance in the evening division constitutes residence for three-fourths of an academic year. Consequently, a day student must attend six semesters to meet residence requirements, an evening student must attend eight. Students authorized to take schedules of less than 10 hours in the day division or less than six hours in the evening division receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit.

HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding three percent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 percent of the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors" and "With Highest Honors," may not exceed 40 percent of the graduating class.

ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 percent of the graduating Juris Doctor candidates. Only students who have completed their full course of study at the National Law Center are eligible for membership.

PUBLICATIONS

The *George Washington Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also devoted to research in other important legal areas. The staff of the *Law Review* is selected on the basis of a writing competition and on the basis of grades. The editorial board is selected from those students who have successfully completed the first year of *Law Review* work. Students receive 4 semester hours of academic credit for the two-year program.

The George Washington *Journal of International Law and Economics*, managed and edited by law students, is a publication of the Law Center. It presents articles and commentaries on public and private international financial development, comparative law, and international law. The staff of the *Journal* is selected on the basis of grades and a writing competition, and students earn academic credit for their work.

MOOT COURT

The moot court competitions provide realistic training in appellate oral advocacy for students in the National Law Center. The Van Vleck Appellate Moot Court Board holds an upper-class competition in the fall. There are also moot court competitions in specific areas of the law, including the Jessup International Law Moot Court, the Patent Law Moot Court, and the Wagner Labor Law Moot Court.

LAW CENTER ORGANIZATIONS

The Advocate—*The Advocate* is the student newspaper of the National Law Center. It features articles by faculty and students on school news and current legal topics.

Asian American Law Student Association—A national organization, the Asian American Law Student Association serves the needs and concerns of Asian Americans.

Black American Law Student Association (BALSA)—The Black American Law Student Association is a national Black law students organization that has chapters at some 80 law schools. BALSA sponsors law speakers and various programs.

International Law Society—The International Law Society is an organization of students interested in the practice of international law. The Society sponsors speakers and various programs.

Jewish Law Student Association—The Jewish Law Student Association sponsors a variety of speaker programs, including a Sunday brunch speaker series.

Law Fraternities and Sororities—The chapters of Beta Kappa Pi, Delta Theta Phi, Phi Alpha Delta, and Phi Delta Phi at the National Law Center sponsor speakers and various social occasions.

Law Students Civil Rights Research Council (LSCRRC)—The Law Students Civil Rights Research Council is a national organization of law students concerned



with the legal problems of civil rights. LSCRRC offers clinical law projects for which students may receive academic credit.

Movimiento Legal Latino—A national Latino law students organization that has chapters at various law schools, Movimiento Legal Latino sponsors law speakers and various programs.

National Lawyers Guild—The George Washington Chapter of the National Lawyers Guild is designed to bring together those lawyers committed to broad issues of social reform.

Student Bar Association—The Student Bar Association is the law student governing body, responsible for allocating funds among the various student organizations. It also conducts a speaker program for the law school. All members of the student body are members of the Student Bar Association.

Student Intellectual Property Law Association—The Student Intellectual Property Law Association, an organization of students interested in patent, trademark, copyright, and related law, conducts an extensive speakers program as well as various social events.

Women's Rights Committee (WRC)—The Women's Rights Committee is primarily interested in the place of women in law schools and in the legal profession. WRC conducts seminars and sponsors speakers.

JOINT JURIS DOCTOR–MASTER'S DEGREE PROGRAM

In certain instances, arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a Master's degree in some fields in the University's Graduate School of Arts and Sciences, School of Government and Business Administration or School of Public and International Affairs. Fields in which this program is available include Business Administration, Economics, International Affairs, Political Science, Public Administration, and Public Affairs. Students must be admitted both to the National Law Center and, separately, to the School that will confer the Master's degree, and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

MASTER'S AND DOCTORAL PROGRAMS

The administration of justice under law is a matter so vast and complex that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The Master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study or concentrate in one of the specialized areas listed below. Courses in each of these areas are included in the 401–600 series. Graduates who complete their work in one of these areas may have the field of specialization noted on their diplomas.

Administrative Law
Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Law, Psychiatry, and Criminology
Patent and Trade Regulation Law
Taxation

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

MASTER OF LAWS

Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR* in a course taken in other graduate divisions of this University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of *C* or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates. The student is expected to include Law 599–600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see Master's Thesis, below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field. Each Master of Laws program of study may include a limited number of courses in the 300 series, with the approval of the Dean.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

Master's Thesis

Each candidate for the degree of Master of Laws is expected to write a Master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a law review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the final semester or summer session before the

student's graduation, provided the student has demonstrated research and writing ability by taking a minimum of 6 semester hours of course work at the National Law Center designated "Research Paper." No thesis waiver is granted for candidates for the degree of Master of Laws with specializations in international law or government procurement law.

The thesis in its final form must be presented to the adviser no later than the date specified in the Calendar. Two complete copies are required. It is the responsibility of the candidate to obtain from the Post-J.D. Programs Office a printed copy of the regulations governing the styling and reproduction of theses. The mandatory thesis binding fee of $15 must be paid at the time of registration for the last semester's work.

Accepted theses become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

Honors

The degree of Master of Laws "With Highest Honors" is awarded students who obtain a minimum cumulative average of 85.

Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate courses related to their fields of interest in other departments of this University. A maximum of 6 semester hours will be credited toward the degree for such courses; however, credit will be granted only if the courses are given on campus. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses numbered 101–200 may be taken for graduate credit only if the student receives the approval of the instructor at the time of registration and does additional work, as prescribed by the department offering the course.

Consortium of Universities of the Washington Metropolitan Area, Inc.

A candidate for the Master of Laws degree may take graduate courses at Georgetown University Law Center through the Consortium of Universities of the Washington Metropolitan Area, Inc. A maximum of 6 semester hours of such courses may be credited toward the degree. Permission to take Consortium courses must be granted by the Dean, the Registrar, and the instructor offering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. To receive the grade of *CR* a student must attain a grade of *C* or higher.

DOCTOR OF JURIDICAL SCIENCE

Entrance Requirements

Admission to candidacy for the degree of Doctor of Juridical Science requires a Bachelor of Arts or equivalent degree from an approved college or university; a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high rank, from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association; a Master of Laws degree with high academic standing; outstanding capacity for scholarly work in the field of law; and faculty approval of the applicant's dissertation topic. Applicants must also demonstrate their writing ability by submitting the Master's thesis or a copy of one or more papers or articles that the applicant has written. Following consultation with the Dean, the applicant must obtain a faculty adviser, to be designated committee chairman, from the regular full-time faculty; reach agreement on the acceptability of the proposed topic for the dissertation; and submit a

detailed outline for the adviser's approval, indicating by chapter and division within chapter the exact scope of the project. There should be a bibliography for each chapter, listing books, reports, cases, and law review articles to be considered. Although the outline cannot predict every detail of the subsequent research, it must be sufficiently definite to afford the Graduate Board a basis for evaluation.

Once the outline is approved, the applicant's committee is expanded to three members; this consultative committee must recommend the acceptance of the applicant to the full Graduate Board. The Board then acts upon the recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an unclassified student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the Dean.

Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year, (2) a course of study and research—designated by the consultative committee and approved by the Graduate Board—of no less than 8 semester hours including Jurisprudence, unless previously taken, and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar, the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of the dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the Dean. Accepted dissertations become the property of the University and are placed in the University's Gelman Library and the Law Library, where the duplicate copies are bound and made available for circulation.

DEGREE PROGRAMS FOR INTERNATIONAL STUDENTS

The National Law Center has several programs of study available to students trained in law outside the United States. These programs fall into two general categories: those directed toward preparing students for a bar examination in an American jurisdiction and those that enable students to return to their countries with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Law Center as a candidate



for the Master of Comparative Law (Foreign Practice) (M.Comp.L.) or Master of Comparative Law (American Practice) (M Comp L.(Am Prac.)) degree.

To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degree. The J.D. degree requires 84 semester hours of work in law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. The M.Comp.L.(Am.Prac.) degree requires 32 semester hours of work and satisfies the requirements of the District of Columbia Bar. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*

Foreign students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broad comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination.

ADMISSION PROCEDURE

Application must be received from *foreign applicants* no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), October 1 for the spring semester, and March 1 for the summer sessions.

Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended are required, but in exceptional cases certified copies will be accepted. Records of state

examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 550 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08541, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does *not* constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test, lists of examination centers, examination dates, and an application blank. On the application for the test, the student should specify that the scores be sent to the Dean's Office.

ENTRANCE REQUIREMENTS

For the Degree of Juris Doctor—Entrance requirements for foreign students are the same as those stated on pages 10–12, except that advanced standing is rarely granted for study in foreign law schools.

For the Degrees of Master of Comparative Law (Foreign Practice) and Master of Comparative Law (American Practice)—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo; and graduation in law with high academic standing from a recognized foreign university. Admission to the American Practice program is limited to the fall semester each year.

For the Degree of Master of Laws—A foreign student will only be considered for admission to the Master of Laws program if he or she has a Juris Doctor or post-Juris Doctor degree with high academic standing from an American university.

For the Degree of Doctor of Juridical Science—The usual entrance requirements are the successful completion of and graduation from a course in arts philosophy, letters, or sciences, equivalent to graduation from a gymnasium lycée, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

DEGREE REQUIREMENTS

Juris Doctor, Master of Laws, Masters of Comparative Law, and *Doctor of Juridical Science*—Degree requirements for foreign students are the same as those stated on pages 14, 18, and 20.

Master of Comparative Law (Foreign Practice)—The student must complete a residence period of at least two continuous semesters. All requirements for the degree must be completed in a period not exceeding three years from the time of

registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses in the Law Center, or in such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 65 at all times.

Master of Comparative Law (American Practice)—The general requirements are the same as those for the degree of Master of Comparative Law (Foreign Practice) except that this degree requires 32 semester hours of course work. However, the courses approved will be limited to the required courses in the Juris Doctor curriculum (see pages 12–13) for those with a civil law background. For those with a common law background, a careful selection of required as well as core elective courses in the Juris Doctor program will be approved. A cumulative average of at least 65 must be maintained at all times.

UNCLASSIFIED STUDENTS

Two types of students may be admitted to the National Law Center as unclassified students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above-average record at another law school that is a member of the Association of American Law Schools or is approved by the American Bar Association may, at the discretion of the Dean, be admitted as an unclassified student to earn credit for transfer to the other law school. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

2. Graduates of law schools that are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as unclassified students.

Unclassified students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an unclassified student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

CONTINUING LEGAL EDUCATION

Members of the Bar who wish to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.



GENERAL INFORMATION

The National Law Center has an enrollment of about 1,700 for the J.D. and Post-J.D. degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 400 are enrolled in the part-time evening division. Three hundred students, many from abroad, are enrolled in the Post-J.D. degree programs.

DAY AND EVENING CLASSES

Day classes meet in the mornings in 50-minute periods and in the afternoon in 50-minute periods and also in sessions of two 50-minute periods, Monday through Friday. *Trial Practice Court* and certain other courses meet for two-hour periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A four-credit course, e.g., Evidence, meets two evenings a week; a three-credit course, e.g., Administrative Law, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., Contracts II, meets one evening a week. The evening division conforms to the standards of the day division, with the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be given in the evening.

SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each summer session by day students. Day students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by evening students. Evening students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

ADMISSION

Applicants are urged to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process there is no discrimination against any applicant because of sex, race, color, religion, handicap, or national origin. An application fee of $30 for a degree candidate ($15 for an unclassified student) must accompany the application.

Forms for application for admission or readmission are available at and should be returned to the Office of Admissions of the National Law Center, George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pages 21–22.

APPLICATION FOR ADMISSION

Juris Doctor Program—Beginning students are admitted only at the start of the fall semester.

The applicant should register with the Law School Data Assembly Service (LSDAS) by completing and mailing the registration forms supplied by the Law School Admission Services (LSAS). No application to this school will be processed unless accompanied by a Law School Application Matching Form, which is found in each applicant's LSAT/LSDAS registration packet. Since an LSAT and/or LSDAS report cannot be produced by LSAS without the Matching Form, it will be necessary to return to the applicant any application received without it. A transcript from each college or university attended should then be sent directly to LSAS, Box 2000, New Town, Pennsylvania 18940. No transcript should be sent to the National Law Center. The LSDAS will analyze the transcript and send a copy to this law school and others designated on the registration form. If the transcript that has been forwarded to LSDAS does not show evidence of receipt of a Bachelor's degree, the applicant will be asked, upon acceptance, to submit a final transcript directly to the National Law Center.

To provide time for the evaluation of credentials of beginning students, all papers, including the Law School Admission Test score, should be received by the National Law Center before March 1. This means that the October or December Law School Admission Test should be taken (see Entrance Requirements, pages 10–12).

All applications of transfer students should be received by the Admissions Office no later than June 1 for the fall semester, December 1 for the spring semester, May 1 for the first summer session, and June 1 for the second summer session.

For additional information, see the official *Pre-Law Handbook* prepared by the Law School Admission Council and the Association of American Law Schools. The Handbook includes material on the law and lawyers, pre-law preparation, applying to law schools, and the study of law, together with individualized information on most American law schools. It may be obtained at college bookstores or ordered from Law School Admission Services, Box 2000, New Town, Pennsylvania 18940.

Master's and Doctoral Programs—Students are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions.

Application for admission, together with all required credentials, must be received by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

Unclassified Students—Lawyers who wish to take graduate courses are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions. Students who wish to earn credit for transfer toward a Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1 Application for admission, with required credentials, for a student who wishes to earn credit for transfer toward a Bachelor of Laws or Juris Doctor degree at another law school (see page 23) should be received at the Office of Admissions of the National Law Center at least one month prior to the first day of registration for the semester or summer session for which application is made.

2 Application for admission, with required credentials, for lawyers who wish to take graduate courses (see page 23), should be received at the Office of Admissions of the National Law Center by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

READMISSION

A student who was previously registered but did not attend during the most recent semester (summer term excluded) should file an application for readmission. Closing dates for readmission are the same as those for admission (see Application for Admission, above).

If the student has attended one or more institutions of higher education during absence from the University or applies as a degree candidate and was previously a nondegree student, he or she must have complete, official transcripts sent to the Dean.

REGISTRATION

Before attending classes each student must register in person. No student will be registered until proper credentials have been filed and approved (see Admission).

No registration is accepted for less than a semester or one summer session.

A student may not register concurrently in George Washington University and another institution. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*.

ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student—Upon receipt of a *final letter* of admission a new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered who was not registered for courses during the preceding semester or summer session must apply for and receive a letter of readmission (see Readmission, above) before becoming eligible for registration.

DATES AND PLACE OF REGISTRATION

Registration is held in Stockton Hall, 720 Twentieth Street, N.W., during the following periods: fall semester, August 18 and 19; spring semester, January 5 and 6. For late-registration fees, see Special Fees, below. Registration may be changed only with the permission of the Dean.

FEES AND FINANCIAL REGULATIONS

The following fees and financial regulations were adopted for the 1983 summer sessions and the 1983–84 academic year.

Tuition Fees

J.D. candidates:	
Full-time program (11 or more hours*), each semester:	
First-year and entering students	$4,050.00
Returning and readmitted students	3,600.00
Part-time program, each semester hour:	
First-year and entering students	290.00
Returning and readmitted students	257.00
Master's degree candidates (LL.M., M.Comp.L., and M.Comp.L. (Am. Prac.)) and Continuing Legal Education students, each semester hour	248.00
S.J.D. candidates,† full program, including the final examination	7,300.00

University Center Fee (charged all students registered on campus)	7.00
Each semester hour, not to exceed $74 per semester	

Special Fees

Application fee (degree candidate), nonrefundable	30.00
Application fee (unclassified student), nonrefundable	15.00
Application fee (unclassified post-J.D. summer student), nonrefundable	10.00
Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission, $350 by June 1)	450.00
Fee for binding Master's theses and S.J.D. dissertations	15.00
Late-registration fee, for failure to register within the designated period:	
During first week of classes	25.00
During second week of classes	50.00
After second week of classes (if permitted)	100.00
Late-payment fee, charged for failure to make payments when due (see Payment of Fees, below)	15.00
Replacement of lost or stolen picture identification card	2.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)	35.00
Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason	15.00
Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2, fee for each additional copy	.50

Registration on campus in the University entitles each student to the following privileges: the services of the Student and Alumni Career Services Center; the use

* With the prior permission of the Dean, a J.D. degree candidate may take more than 11 semester hours after the first year of study.

† The tuition fee is to be paid at the rate of $1,825 per semester for four successive semesters, exclusive of the summer term or terms. If the Faculty should approve an extension of time, the student must maintain enrollment

of the University Library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; subscription to the *Hatchet*, the student newspaper; admission to University debates, and medical attention as described under Student Health Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University with student identification number shown in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the ninth week of classes for the fall and spring semesters. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Returned Check Policy—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

PREPAID AND DEFERRED PAYMENT PLANS

Several commerical programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106

Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100

The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean. Withdrawal from courses is permitted after the midpoint of a semester only in extraordinary circumstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
   Withdrawal on or before Saturday of the first week of classes 90%
   Withdrawal on or before Saturday of the third week of classes 75%
   Withdrawal on or before Saturday of the fifth week of classes 50%
   Withdrawal after the fifth week of classes ..... None
2. For a *change in status from full-time to part-time* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in a full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

FINANCIAL AID

The National Law Center has been able in recent years to assist many students in obtaining the financial aid they require, through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

*No refund of the $100 deposit required of entering students is granted. Regulations covering withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes*.

GRADUATE AND PROFESSIONAL SCHOOL FINANCIAL AID SERVICE

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSFAS), which provides an analysis of an applicant's financial needs. Entering students wishing to receive financial aid should request the materials from GAPSFAS, Educational Testing Service, Box 2614, Princeton, New Jersey 08541. The information provided by the applicant and the applicant's parents will be analyzed and a copy of the report will be sent to the Law Center. In addition, students entering the National Law Center in the day program who desire to be considered for a scholarship must submit a letter to the Law Center by March 1 outlining their academic qualifications, their extracurricular activities, and their reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in time for their reports to be received at the Law Center as early as possible, since the Committee on Student Financial Aid of the Law Center will begin making awards in March, and available funds are limited.

No awards will be made to an entering student until the admission process has been completed.

JURIS DOCTOR PROGRAM

Scholarships and Research Assistantships

Application and correspondence concerning scholarships and research assistantships should be sent directly to the Dean. Unless otherwise specified, application and supporting credentials should be submitted no later than March 1 preceding the period for which the award is made.

Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973)—Scholarship aid for needy law students from the Washington, D.C., area.

Mildred Gott Bryan Scholarship Fund (1965)—Partial scholarship aid for students in the National Law Center.

Charles Worthington Dorsey Memorial Scholarship (1974)—Memorial to Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition scholarship for the course leading to the degree of Juris Doctor, awarded to a needy and promising graduate of this University with a Bachelor of Arts or equivalent degree. Ordinarily this scholarship is awarded once every three years.

Honor Scholarships—Two scholarships available each year to students entering upon full-time study. Each scholarship provides a cash award, in addition to tuition aid, in an amount depending on need, for all three years. These scholarships are awarded on the basis of outstanding college records, both academic and extracurricular; Law School Admission Test scores, and need. To retain the scholarship for the second and third years, the candidates must maintain a B average, both for each year and cumulative.

Howrey and Simon Scholarship (1982)—An annual award to provide tuition assistance to worthy students.

Hunton and Williams Scholarship (1981)—An annual award of $1,000 given by the law firm of Hunton and Williams in recognition of the quality of the legal education offered at this law school.

Law Center Tuition Remission—For Juris Doctor students, based on financial need.

Phi Delta Delta Scholarships (1959)—Zeta Chapter of Phi Delta Delta Legal Fraternity (International) provides tuition aid to a student in the second year of the Juris Doctor program who excelled in scholastic achievement and service to the Law Center in the first year.

Vernon Romney Scholarship Fund (1977)—To provide a scholarship to som
worthy student in the Law Center.

Trustee Scholarships—Scholarships awarded each year to entering full-ti
students, for tuition aid, in amounts depending on need. Candidates must ha
demonstrated qualities of leadership, in addition to scholastic attainment. T
retain the scholarship, the successful candidate must maintain a *B* average bo
for each year and cumulative. Application must be made to the Dean befor
March 1.

Tuition-aid scholarships are also available to continuing second- and third
year full-time students with demonstrated scholastic ability, on the basis o
financial need and capacity for leadership. Application should be made to th
Dean prior to June 1.

Frank S. Whitcomb Scholarship Fund (1971)—Bequest of Frank S. Whitcomb f
the purpose of aiding and assisting worthy young men and women in securing
legal education.

Graduate Fellowship Information Center—Students may also wish to visit the
Graduate Fellowship Information Center (Gelman Library, 2130 H St., NW, 6
additional information on fellowships and grants.

Loan Funds

Through the generosity of friends of the University a number of loan funds are
available. Among them are the Lyle L. Alverson Loan Fund, the Robert Ash Law
Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafri
Foundation Minority Law Student Loan Fund, the Robert M. and Mary McConn
Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the
Forrester Davison Loan Fund, the District of Columbia Bar Association Loan
Fund, the J.W. Ehrlich Foundation Loan Fund, the Newell W. Ellison Loan Fun
the Harold L. and Violet George Foundation Loan Fund, the George Washingto
Law Association Loan Fund, the Morris Golub Loan Fund, the Jephson Educ
tional Trust Loan Fund, the Law Association Loan Fund for the law classes o
1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 194
1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the La
School Loan Fund, the Oscar Lawler Memorial Loan Fund, the Horace L. Lohnes
Memorial Assistance Fund; the Jessie B. Martin Loan Fund, the Robert N. Miller
Loan Fund, the Joan Murphy Loan Fund, the Mike Pelekiri Loan Fund; the Pi
Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan
Fund; the Samuel L. Samuel Loan Fund, the H. William Tanaka Law Student
Assistance Loan Fund, the Orville Hassler Walburn Memorial Loan Fund; the
W.H. Williams Memorial Student Loan Fund; the Ruth F. Wilson Loan Fund and
the Yadao and Kanemoto Loan Fund.

In addition, financial assistance is available through the Guaranteed Student
Loan Program, National Direct Student Loans, work-study, and other sources.

Application for financial assistance should be made in the Office of the Dean.

MASTER'S AND DOCTORAL PROGRAMS

Fellowships and Scholarships

Application should be made before March 1 preceding the period for which the
award is made. The applicant should submit an application for admission as a
degree candidate and a personal letter applying for a fellowship to the Dean. The
letter of application should contain complete biographical data, information
concerning experience in practice or teaching, copies of or citations to published



legal writings, and such other information the student believes will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of their law faculty directly to the Dean. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

Marcus B. Finnegan Memorial Fellowship—Established in memory of Marcus B. Finnegan, LL.M. '57, who, as an alumnus, lawyer, and teacher, brought distinction to the field of patent law. The Fellowship was established in 1979 with generous gifts by Mr. Finnegan's law firm, Finnegan, Henderson, Farabow, Garrett & Dunner, his clients, and his many friends. The income from the Fellowship is used to finance a Graduate Fellowship in Intellectual Property with a requirement that the recipient of the Fellowship prepare a publishable paper in the field of international intellectual property.

Richard Paul Momsen Scholarships for Brazilian Graduate Law Students—Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1982–83 and alternate years, for the study of U.S. constitutional law and the law of patents and trademarks.

Teaching Fellowships—Three or four fellowships available each year with a stipend of $8,000 plus tuition for an approved course of study leading to an advanced degree. Teaching fellowships are awarded for a term of two academic years. Fellows conduct the first-year course in Legal Research and Writing and work with the students to improve their legal writing ability. By arrangement with the Dean, they may also be given the opportunity to teach additional courses.

PRIZES

Jacob Burns Prize—Established by Jacob Burns, a law alumnus and Honorary Trustee of the University. A medal and a cash award presented annually to each

of the two members of the winning team in the upper-class Van Vleck Moot Co competition.

The Michael D. Cooley Memorial Prize—A plaque and a cash award given t that individual in each graduating class who has been most successful maintaining his or her compassion, vitality, and humanity during law school. recipient of this award is selected by the graduating class during the spring of t third year at the National Law Center.

Ogden W. Fields Graduate Prize—Awarded annually to the graduate stude who has demonstrated the highest overall proficiency in a course in labor la

Charles Glover Prize—Established by Charles Carroll Glover, Jr., an Honora Trustee of the University, in memory of his great-grandfather, an illustrio member of the bar of the District of Columbia. A cash award given annually to t student who has attained the highest average grade in the third-year full-tim course.

Kappa Beta Pi Prize—Awarded by Eta Alummae Chapter to the law student who attains the highest average for the first year.

John Bell Larner Prize—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course of the degree of Juris Doctor.

John Ordronaux Prizes—By bequest, awarded annually to the student wh has attained the highest average grade in the first-year, full-time course and to th student who has attained the highest cumulative average grade at the end of th second-year, full-time course.

United States Law Week Award—Presented to an outstanding senior law student.

Jennie Hassler Walburn Prize—A cash award to the outstanding student in th field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

REGULATIONS

ACADEMIC WORK LOAD

Juris Doctor Candidates—Juris Doctor candidates without substantial outside employment may take a program of studies of 14 hours a week. Such students may take courses in the evening only if they are not scheduled in the daytime and if a majority of the hours taken are in day courses. The Dean is authorized to approve programs of study of more than 14 hours in exceptional cases, however no program will be approved that would permit the student to complete requirements for the degree in less than 28 months after beginning the first year of law study. Students with more than 20 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week; the minimum load is 8 hours except in special cases when 6 hours may be approved by the Dean for a limited time. A minimum schedule for 11 hours in the day division is required except in exceptional circumstances when a reduced program is authorized by the Dean.

Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the Dean to take a Bar Review course.

Students may transfer from the day division to the evening division only with the permission of the Dean.

With the approval of the Dean, second- and third-year students may take a maximum of 6 semester hours of appropriate courses in other departments of the University; such a student must receive a grade of at least *B* to obtain credit for such courses, and in no event will the grade count in computing the cumulative average.

Master's Candidates—Master's candidates without substantial outside employment may take a maximum of 12 hours a week. Students with more than 20 hours of outside employment must take a limited program of study not to exceed 8 hours a week. The minimum load is 4 hours unless approval for fewer hours is given by the Dean for a limited time.

ATTENDANCE

Regular attendance at classes is required and is necessary for successful work. A student who is deficient in class attendance in any course may be barred from taking the examination.

CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of the same course without the approval of the Dean. Students may drop courses only with the written approval of the Dean. In addition, approval of the instructor is ordinarily required unless the request is made early in the semester. Under no circumstances may a student drop a course after the last day of classes in any semester or summer session.

RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination in seminars and in other courses, as indicated in the course descriptions. To receive a numerical grade on a research paper, the paper must be submitted by the last day of classes in the semester or, with the permission of the instructor, by the last day of the examination period (the last day of any examination given in any course). For sufficient reason, the instructor may extend the deadline (but not later than the last day of the examination period of the following semester, or without express permission of the Dean, not later than the normal graduation date for the student), subject to the following conditions: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted; (2) the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit). To receive credit, a minimum grade of 65 is required for J.D. candidates and 75 for LL.M. candidates. Failure ultimately to submit any paper for the course will result in a grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester, with the approval of the Dean such students may register for more than one such course each semester.

The following guidelines have been approved by the faculty and are intended to apply to Law 344, *Legal Writing*, and to research paper courses that satisfy the legal writing requirement. The faculty recommends that the paper's topic and length should receive specific approval by the faculty member. Furthermore, an outline should be submitted, to be followed by a draft. The purpose of a draft, submitted during the course of the semester, is to allow the student the opportunity to improve the paper. A faculty member has the discretion to require

a revised draft or to permit one if so requested by the student. A revised draft is necessary only if the professor requires it.) Approval of the topic, outline and draft should be by a specified date. The paper should follow the Blue Book style.

EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a make-up examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit (minimum grade of 65 required for J.D. candidates and 75 for LL.M. candidates) or (2) having the grade I (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination



in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.

CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a Credit/No Credit basis, 12 semester hours of elective course work on a Credit/No Credit basis; a grade of Credit will be recorded if the course is satisfactorily completed with a grade of 65 or better. No student may change from a numerical grade to a Credit/No Credit basis in a course during the last four weeks of classes except with the permission of the instructor. An unexcused failure to take an examination in a course or failure to submit a required research paper will result in the recording of a grade of 45 for a course taken on a Credit/No Credit basis.

No student may take more than 17 semester hours of courses (including Law 220 and other courses regularly given on a Credit/No Credit basis) on a Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to take courses on a Credit/No Credit basis. In the opinion of the faculty, a student's election to take courses on a Credit/No Credit basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85–100, *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poor—below standard for graduation; 45–54, *F*, Failure. In Law courses 220, 321–22, 323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, 593, and 620 grades are *CR*, Credit (minimum grade of 65 required for J.D. candidates, 75 for LL.M. candidates); *NC*, No Credit. In Law 220, the grade of *H*, Honors, may be earned for work of excellent quality. A student who has been excused from taking a regularly scheduled examination is given the grade of *I*, Incomplete. See Examinations above for grade upon failure to take an examination. Grades between 55 and 100 indicate that the work has been completed and credit given. Grades between 55 and 64, however, do not represent satisfactory work and adversely affect a student's cumulative average. No credit is given to J.D. and M.Comp.L. candidates for grades below 55 or to LL.M. candidates for grades below 65. No grade may be changed by an instructor after it has been posted in the Law Center or disclosed to a student unless there has been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (*F*) has the right to retake the course once, from the same or a different instructor, but only within the next academic year. (This does not apply to post-J.D. students.) The grade received in the retaken course is entered into the student's record in addition to the original grade, and both grades are included in computing the student's average. A student may exercise the right to retake a course only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken while a candidate for a particular degree.

EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

Candidates for the Degree of Juris Doctor—A student whose cumulative average at the end of any semester falls below 65.0 but is above 64.0 will be put on probation. If such a student fails to raise the cumulative average to 65.0 at the end of the next semester, the student will not be permitted to register for any succeeding semester unless he or she petitions for and receives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails or receives a grade of No Credit in more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which he or she was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school and to receive a full refund of the tuition paid for the semester or to complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond his or her control and that he or she has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

Candidates for Master's and Doctoral Degrees—A candidate for a Master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 is required for the Master of Laws degree and a cumulative average of 65 for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the Dean. Such a student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Dean or the Board for Graduate Studies.

Unclassified Students—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.

SUMMER SCHOOL CREDIT

Students planning to attend summer sessions at other law schools and desiring to use the credit toward their Juris Doctor program at the Law Center must first have the courses they wish to take approved by the Dean. Students may not take

courses in summer sessions at other law schools in this vicinity if the same courses are being given during the summer sessions at the National Law Center. In no event will credit be given for unsatisfactory work or be recognized in excess of that which might be obtained in a similar period in this program. Students who register at another law school must provide the Dean with an official transcript of their work there promptly on its completion.

TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a 50¢ fee is charged for each additional transcript.

CONTINUOUS ENROLLMENT

Degree candidates are expected to maintain continuous enrollment until *all* degree requirements are satisfied. By failing to register for one semester or more, the student breaks registration and must be readmitted (see Readmission, page 27). A readmitted student is required to satisfy the curriculum requirements existing at the time of readmission.

GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have met the admission requirements of the National Law Center; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation form must be filed at the time of registration for the last semester or summer session of the final year. Students completing degree requirements during the summer sessions will be awarded diplomas "no formal convocation" September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions. If they wish, such students may participate in the Winter Convocation.

ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned, degrees earned, honors received, participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics), and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of the law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.



CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

The Center for Academic and Administrative Computing (CAAC) is located in the Academic Center, 801 22nd St., N.W. CAAC facilities are normally available 24 hours a day during the academic year, to all faculty, staff, and students.

CAAC encourages interest in computers by providing computing facilities and by offering short courses and technical assistance. Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request and without charge.

CAAC maintains two IBM 4341s (VM SP and OS VS1). A full range of compilers and application software packages is available including (but not limited to) CMS XEDIT, FORTRAN, COBOL, PL/1, PASCAL, APL, SPSS, SAS, BMDP, ASSEMBLER ASSIST, and SCRIPT. In addition, CAAC provides an easy-to-learn, terminal-based text-editing system on a PDP 11-70 computer.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

STUDENT SERVICES

RESIDENCE HALLS

The University does not provide regular residence hall space for graduate students. However, the Housing and Residence Life Office refers graduate students to apartments as they become available in University-owned buildings in the campus area. Additionally, the Housing and Residence Life Office operates an Off-Campus Housing Resource Center, and attempts to provide information and assistance for those seeking accommodations. For complete information on this service, as well as apartment guides and referrals, interested applicants should contact the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052.

FOOD SERVICE

Contract food service is available from August to May, and is based on the undergraduate academic calendar of registration, exams, and vacation periods. Accommodations for the law school calendar are made. The rate for the seven-day, 19 meals per week plan has been set at $1,632. The any 14 meals per week plan costs $1,566, the any 10 meals per week plan, $1,512. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center. Meal coupons may also be used on a cash-equivalency basis in the Marvin Center first floor cafeteria and in George's on the fifth floor.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the departments offering course work in the performing arts, and other student and faculty organizations.

The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies that provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

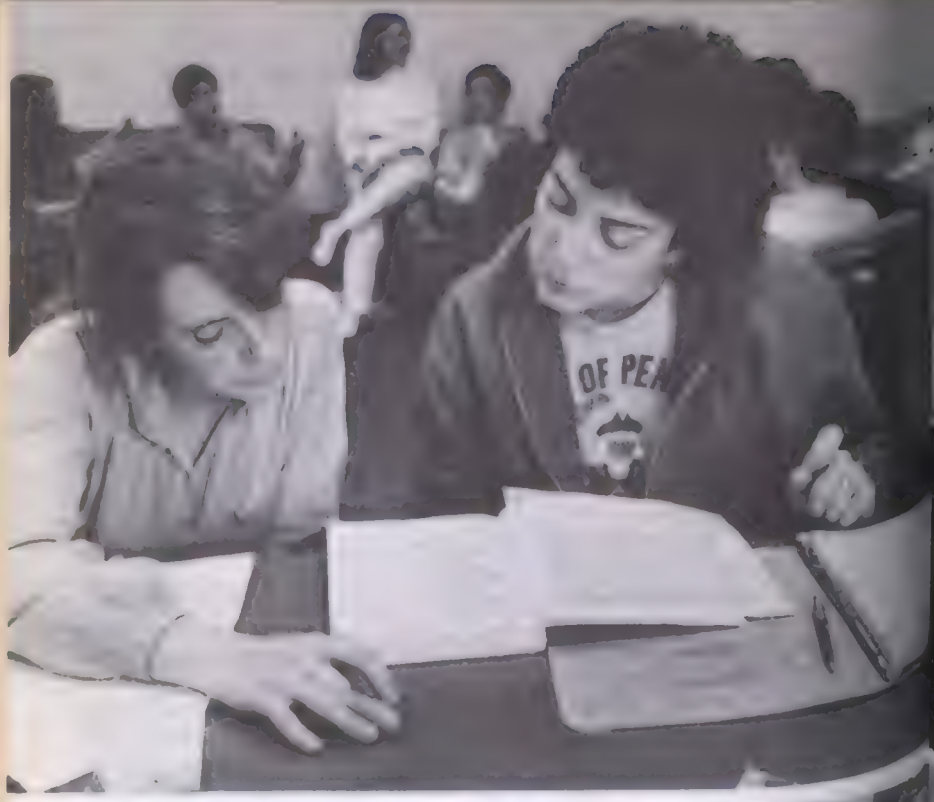
The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should contact the Student Health Service or Office of the Dean of Students.

STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside employment to not more than 20 hours (see Academic Work Load, page 34). It is urged that all full-time students refrain from engaging in outside employment during their first year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will compete with time needed for adequate study and preparation, which are at the heart of a good legal education.

PLACEMENT SERVICE

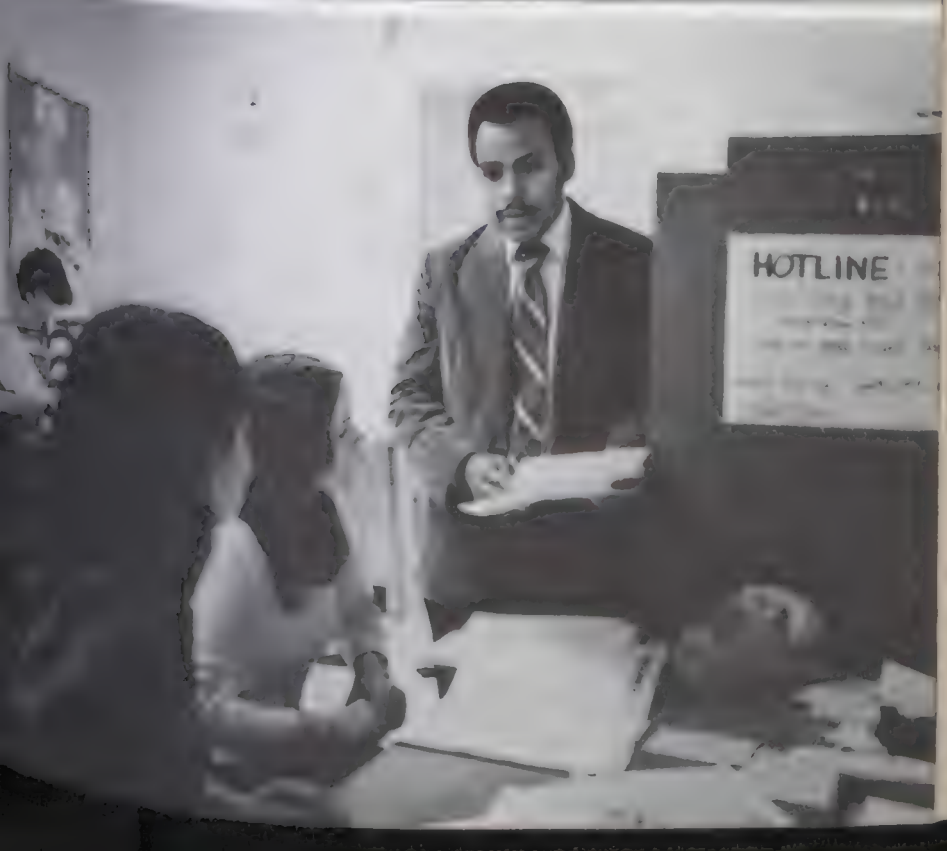
The Law Center takes a continuing interest in the placement of its students and alumni. The Dean, the Faculty, and the Career Development Office cooperate in providing a full range of placement services. The Career Development Office is responsible for providing career development services to students, alumni, and prospective employers. Services include up-to-date job listings, (both full- and part-time), newsletters of current career information, counseling, resume preparation assistance, maintenance of a career development resource library, and the





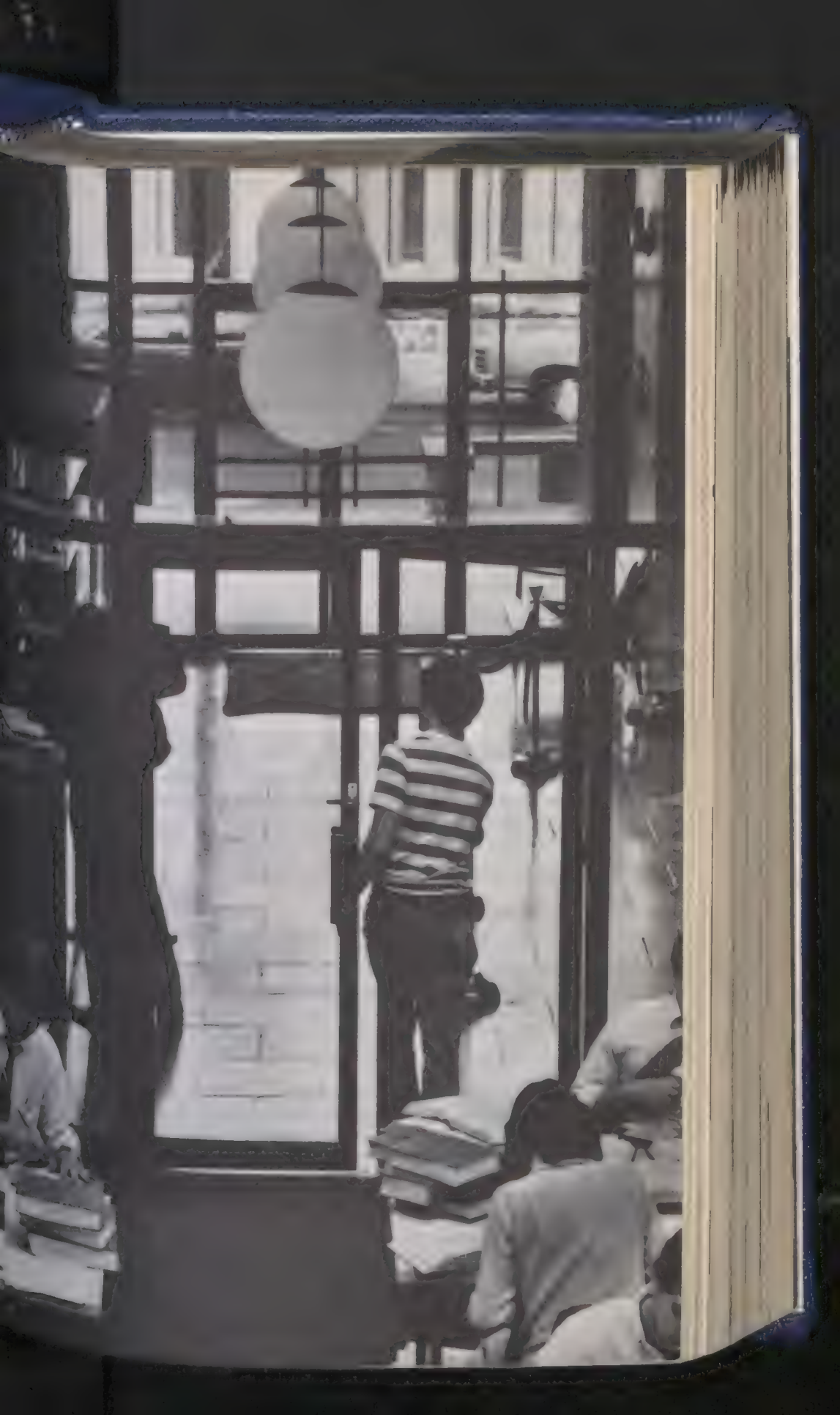





HOTLINE







planning and presentation of forums covering legal career topics as well as alternative career options. On-campus interview programs are arranged in the fall of each academic year to provide prospective employers the opportunity to interview second-year students for summer positions and third- and fourth-year students and LL.M. candidates for permanent positions. Beginning in the fall of 1983, regional off-campus interview programs will be included in the interview schedule.

Two hundred seventy-seven members of the 1982 graduating class informed the Career Development Office of their positions. There was considerable variety in the types of positions obtained, with 165 in private law firms, 41 with government agencies (both federal and state), 19 with corporations, 35 as judicial law clerks, five with public interest organizations, three in the military JAG service, post-J.D. graduate programs, and one each with a trade association, with a labor union, and in a teaching position. These positions are located in 29 states and the District of Columbia.

VETERANS BENEFITS

The veterans counselor, located on the third floor of Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington DC 20421.

OFFICE OF SERVICES FOR STUDENTS WITH DISABILITIES

The Director of the Office of Services for Students with Disabilities coordinates advising, orientation, and special services that address the needs of disabled students. The Director also serves as a central point of contact from which the University community may obtain information and assistance in serving disabled students. A resource library maintained in the Services Office is available for general use.

In addition to coordinating a program of general assistance to promote integration of disabled students as fully as possible into the life of the University community, the Director administers reading and sign language services for those with visual and auditory handicaps.

The Office of Services for Students with Disabilities is located on the fourth floor of Rice Hall, 2121 Eye Street, N.W.

COURSES OF INSTRUCTION

COURSES FOR JURIS DOCTOR CANDIDATES

CAREER PLANNING AND COURSE SELECTION

One of the great strengths of the National Law Center is the diversity of its course offerings and the flexibility it offers students to design their programs to fit their interests and career plans. Every spring a series of counseling sessions is held to provide students with an overview of course offerings in various areas of the law and to assist them in selecting courses and defining their career objectives. Students also may consult members of the faculty and the Associate Dean for Student Relations for course and career planning. In addition, the Career Development Office provides a central storehouse of information regarding many types of legal careers.

The Law Center's broad offering of elective courses is listed below. Courses numbered 400 and above are generally more advanced, but are open to second- and third-year students who have taken the prerequisite courses. Both second- and third-year students may take more than one such course with the permission of the Dean.

Among the courses offering clinical work are: Law 343, 345, 346, 396, 398, 399, 459, 516, 579, and 596.

The courses of instruction listed below are subject to change. The University reserves the right to withdraw any course announced.

ELECTIVE COURSES (NUMBERED 301–400)

Administrative Law (372)
Admiralty (302)
Advanced Criminal Procedure (334)
Advanced Legal Writing (380)
Agency and Partnerships (311)
Appellate Practice and Procedure (388)
Collective Bargaining and Labor Arbitration (339)
Commercial Paper (314)
Community Legal Clinic (346)
(1) Civil Administrative Law Clinic
(2) Immigration Clinic
(3) Outside Clinical Placement
(4) Small Business Clinic
(5) Institute of Law and Aging
Community Property/Marital Property (349)
Comparative Law (307)
Conflicts (309)
Corporations (312)
Creditors' Rights (318)
Current Decisions (321–22)
Disabled People and the Law (397)
Domestic Relations (348)
Federal Antitrust Law (330)
Federal Jurisdiction (332)
Government Contracts (355)
Insurance (347)
International Law and World Order (303)
Journal of International Law (323)
Jurisprudence (335)
Labor Law (341)
Land Use Control (328)
Law and Accounting (351)
Law and Medicine (390)
Law and the Deaf (398)
Law Students in Court (345)
Law Students Civil Rights Research Council (343)
Legal Activism (396)
Legal Process (315)
Legal Writing (344)
Medicine for Lawyers (389)
Modern Real Estate Transactions (327)
Moot Court (342)
Patent Law (359)
Patent Office Practice (362)

Product Liability (331)
Problems of the Consumer (395)
Remedies (375)
Sales and Sales Finance (313)
Taxation—Corporations and Shareholders (340)
Taxation—Federal Estate and Gift (338)
Taxation—Federal Income (336)
Trial Practice Court (385)
Trusts and Estates (I–II) (325–26)
Unfair Trade (329)
United Nations Law and World Order (304)
Women and the Law (394)

ADVANCED COURSES AND SEMINARS (NUMBERED 401–600)

Administrative Law Seminar (401)
Administrative Practices and Procedures (FDA) (411)
Advanced Topics in Patent Law (527)
American Legal History (593)
Banking Institutions and Their Role in Real Estate Investments (502)
Business Planning (424)
Child, Family, State (487)
Chinese Law (547)
Clinical Studies in Environmental Law (516)
Clinical Studies in Urban Law (579)
Comparative Labor Law (440)
Constitutional Law Seminar (592)
Control of Toxic and Hazardous Substances (517)
Copyright Law (525)
Crime Lab (473)
Current Problems in Land Use Controls (504)
Drugs and the Law (481)
Energy (512)
Environmental Law I (508)
Environmental Law II (509)
Environmental Litigation (513)
Environmental Planning (511)
Equal Employment (446)
Equal Employment Claims and Litigation (450)
Estate Planning (553)
Food and Drug Law (412)
Government Contracts (435)
Government Procurement Law (431)
Graduate Clinical Studies (596)
Health Care Delivery Systems (408)
Immigration Law (586)
Independent Studies (597)
Individual Rights (587)
Internal Union Affairs (444)
International Economic Law (426)
International Humanitarian Law of Coercion Control (533)
International Law of Air and Space (531)
International Law of Human Rights (537)
International Patent Law (521)
Labor Law (447)
Labor Litigation (448)
Labor Relations (443)
Labor Standards (442)
Land Development Law (Simulation Course) (501)
Law and Criminology I, II (475, 476)
Law of Criminal Corrections (480)
Law of the Near East (548)
Legal Aspects of International Business Transactions (427)
Legal Research and Writing—Foreign Students (620)
Legislative Drafting (591)
Natural Resources Law (514)
Negotiations (535)
NLRB Procedures (445)
Occupational Safety and Health (OSHA) (451)
Performance of Government Contracts (432)
Pollution Control Law (515)
Professional Responsibility (594)
Public Economic Policy and the Law (403)
Public Policy and Mass Media (413)
Public-Sector Labor Law (452)
Research in Patent, Trademark, and Copyright Law (529)
Research in Public Law (598)
Science and the Legal Process (492)
Securities Regulation (404)
Selected Topics in Taxation—Capital Gains and Losses (561)
Soviet Law (546)
Taxation—Deferred Compensation I, II (565, 566)
Taxation—Exempt Organizations (557)

Taxation—Oil and Gas (559)
Taxation—Partnerships and Subchapter S (551)
Taxation—Real Estate and Income (558)
Taxation—Special Corporation Problems (555)
Taxation—State and Local (560)
Tax Practice (567)
Thesis (599–600)
Trade Regulation (417)
U.S. Regulation of International Trade (542)
U.S. Trademark Law (526)
Use and Control of Nuclear Energy (518)
Water Resources (510)

COURSES NOT OFFERED 1983-1984

Chemical Patent Practice (524)
Computers and the Law (585)
Criminal Practice (479)
Criminal Tax Prosecution (552)
Diplomatic and Consular Law and Practice (536)
Disability Problems (441)
Fraud in Patent Practice (363)
Income Taxation of Foreign Business and Investment (562)
Intergovernmental Relations I, II (505, 506)
International Law of the Sea (532)
Law and Economic Development (407)
Law and Psychiatry (486)
Law of Privacy (589)
Legal Problems in Education (588)
Patent and Know-how Licensing (522)
Patent Interference Practice (528)
Police and the Community (477)
Practical Economics for Lawyers (415)
Regulated Industries (414)
Regulation of Securities Markets (405)
Special Problems of Tax Policy (564)
U.S. Foreign Relations Law (534)

COURSE DESCRIPTIONS

The courses of instruction are described below. The number of hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, a year course giving two hours of credit each semester is marked (2–2) and a semester course giving two hours of credit is marked (2).

In most courses, a final examination is held during the examination period and the grade in the course is determined in large part by that examination. These courses are parenthetically marked "Examination."

Courses that require the preparation of a major research paper in lieu of an examination are parenthetically marked "Research Paper." The satisfactory completion of such a paper by a student individually will satisfy the Legal Writing curriculum requirement for the J.D. degree.

Courses parenthetically marked "Problem Assignments," "Writing Assignments," "Take-home Examination," "Choice of Paper or Examination," or "Clinical Work" indicate the nature of the method planned by the instructor for determining in major part the grade to be given for the course. Only research papers qualify for the Legal Writing curriculum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning and afternoon. Evening classes begin at 5:30 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A parenthetical designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions, and also usually whether it will meet in the day or evening. When a double-numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring.

REQUIRED COURSES

203–4 Contracts I-II (4–2) **Nash, Cibinic, Pock, Caplan**
Legal remedies of contracting parties, including damages in contract and quasi-contract; specific performance; reformation; rescission; remedies in tort; acts creating and terminating contractual rights, including offer and acceptance; mistake; problems of proof; function of consideration; conditions; assignments; third-party beneficiaries; effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

207 Torts (4) **Seidelson, Banzhaf, Schwartz, Sirulnik, Reitze, Dienes**
Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses; causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)

211 Property (4) **Starrs, Schiller, Brown, Chandler**
Basic concepts of personal property. Real property, historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interest at common law and after the Statute of Uses, introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Fall—evening, spring—day; summer 1983)

212 Constitutional Law (4) **Mayo, Barron, Park, Cheh, Dienes, Harris**
Basic principles of American constitutionalism; judicial function in constitutional cases; implementation of doctrines of separation of powers, federalism, limited government; development and exercise of national powers; introduction to civil rights and liberties. (Examination) (Spring—day and evening)

215 Criminal Law and Procedure (4) **Starrs, Robinson, Zenoff, Sirulnik, Caplan**
Purposes of criminal law, elements of criminal liability, selective consideration of specific crimes, introduction to criminal procedure. (Examination) (Fall—day; spring—evening)

218 Civil Procedure (4) **Sharpe, Barron, Schwartz, Kayton, Cheh, Raven-Hansen, Reitze, Trangsrud**
Mechanics of litigation—rules that govern the process by which rights and duties studied in substantive law courses are enforced; pleadings; discovery; pre- and post-trial motions; jurisdiction and venue; equity jurisdiction and trial by jury; former adjudication. Emphasis on Federal Rules of Civil Procedure but principles and main problems indigenous to all procedural systems are developed. (Examination) (Spring—day and evening) **Staff**

220 Legal Research and Writing (2)
Introduction to use of a law library; research experience in primary, secondary, and specialized sources of law; practice in proper legal citation form. Instruction and practice in legal writing. The grade *H* (Honors), *CR* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For Credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Fall—day and evening) **Staff**

221 Moot Court (1)
Instruction and experience in the writing and rewriting of an appellate court brief and in the argument of an appellate case. This course must be successfully completed in order to earn credit for Law 220. The grade *H* (Honors), *CR* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For Credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Spring—day and evening)

222 **Professional Responsibility and Ethics** (1) Cibinic and Staff
Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second, third, or fourth years. Ethical problems involved in civil and criminal counseling and litigation. Codes of Professional Responsibility and legal discipline; roles of bar associations and courts. (Examination) (Beginning 1984 fall—day and evening)

232 **Evidence** (4) Seidelson, Robinson, Park, Schechter
Preparation and presentation of evidence, including proof of writings; qualification and examination of witnesses with emphasis on impeachment; privilege; opinion testimony; determination of relevancy; demonstrative, experimental, scientific evidence; application of the hearsay rule. (Examination) (Spring—day and evening)

ELECTIVE COURSES

302 **Admiralty** (3) Sharpe
American practice and jurisdiction in admiralty; saving clause actions at law. Substantive maritime law of title and possession, maritime liens, personal injury and wrongful death; charter parties and bills of lading; general average and salvage and marine insurance, collisions. Lawmaking methods: judge-made law, statutes, international commercial custom, and treaties. (Examination) (Fall—evening; spring—day)

303 **International Law and World Order** (3) Mallison, Harris
An introduction to international law that provides the background for specialized seminars. Emphasis on national states as participants in decision-making processes, with consideration of public bodies and other participants; analysis of range of available sanctions; roles and effects of international agreements under United States Constitution; introductory study of the World Bank. Complements but does not repeat material in Law 304. (Examination) (Fall—day and evening; spring—day; summer 1983)

304 **United Nations Law and World Order** (2) Mallison
Introduction to international law through study of law and practice of United Nations Charter, structure and process of decision of United Nations; maintenance of international peace and security—peaceful settlement of disputes and national and collective self-defense; current problems considered by the General Assembly and Security Council and recent decisions of the International Court of Justice. Complements but does not repeat the material in Law 303. (Examination) (Spring—day and evening)

307 **Comparative Law** (3) Brand
Introduction to comparative method and analysis; basic features of civil law systems; sources; legal profession; judicial organization; constitutional issues. Selected issues of contemporary and practical interest, such as domestic relations; inheritance; contracts; torts; consumer protection. Emphasis on the intimate relationship between comparative law and conflict of laws; description of methods of conflict avoidance and problems attendant upon transnational litigation. (Examination) (Spring—day)

309 **Conflicts of Laws** (3) Seidelson, Pock, Lowther
Legal problems arising from occurrences transcending state or national boundaries; jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice of law principles and their application to specific fields, including torts, contracts, property, family law, administration of estates, business associations. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Lowther—(Problem Assignments); Seidelson, Pock—(Examination) (Fall—evening; spring—day and evening)

311 **Agency and Partnerships** (2) Sharpe, Schiller
Employment relations; vicarious liability of employers for employees' torts; scope of employment; and independent contractors; agents' authority and apparent authority to contract for their principals; ratification; nonprofit

associations; the formation, operation, and termination of partnerships; limited partnerships. (Examination) (Fall—day and evening; summer 1983)

312 **Corporations** (4) Green, Solomon, Park, Cheh, Seligman
Corporate law, with emphasis on operations and financing of corporations. Control of corporations; action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty; insiders' transactions in shares of the corporation. Derivative suits; kinds of shares; dividends, corporate distributions. (Examination) (Fall—day and evening)

313 **Sales and Sales Financing** (2) Rothschild, Zubrow, Shulman
Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening; spring—day)

314 **Commercial Paper, Check Collection, and Banking** (2) Rothschild, Zubrow, Shulman
Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice. Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Fall—day; spring—day and evening)

315 **The Legal Process** (3) Robinson, Levine
American legal institutions and their interrelationships and processes. Jurisprudential concepts in the context of specific problems commonly faced by private and governmental lawyers, legislators, courts, and administrative agencies. Issues of statutory interpretation, the roles of courts in making new law, and the allocation of functions between courts, administrative agencies, legislatures, and private decision-makers. (Examination) (Fall—day)

318 **Creditors' Rights** (3) Cheh, Zubrow, Shulman
Creditors' remedies and debtors' protections under state law: writs of attachment, garnishment, and execution; acquisition of liens and forced sales of property; self-help arrangements; and security agreements. Bankruptcy under federal law: who may file; the creation and administration of the bankruptcy estate; powers of the trustee; discharge of debt; rehabilitation plans for individuals under Chapter 13. (Examination) (Fall—day; spring—day and evening)

321–22 **Current Decisions** (1 or 2 per semester)
Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Academic year—day and evening)

323 **Journal of International Law** (1 to 4)
Limited to editors of the student staff of the *Journal of International Law and Economics*. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

325–26 **Trusts and Estates I–II** (3) Weaver, Chandler, Solomon, Sims
Noncommercial transfers of wealth at death or during life. Law 325: essentials; elements and formalities for creation of trusts and execution of wills; revocation and alteration; grounds for contest; limits on property owner's power to control intestate succession. Law 326: dispositive provisions; common questions of construction; future interests problems; administration of estates and trusts; charitable trusts. Prerequisite to Law 325: Law 211 to Law 326: Law 325. (Examination and Problem Assignments) Law 325: fall—day and evening; spring—day; Law 326: spring—evening)

327 **Modern Real Estate Transactions** (3) Brown, Schiller
Advanced problems in purchase and sale of real estate; legal responsibility and functions of buyer, seller, broker, escrow agent, conveyancing attorney, title examiner, abstractor, insuror of title; process of examination and assurance of title and other interests in realty, including recording, registration and title insurance systems, settlements and closings, warranties, hazard insurance; emerging problems related to cooperatives, condominiums, and property-owners' associations; problems related to compliance with subdivision, zoning, building and housing code regulations. (Examination) (Spring—day; summer 1983)

328 **Land Use Control** (3) Kaufman
(*Formerly Law 503, Land Development Planning*)
Selected problems in urban and regional planning; applications of zoning, urban renewal, and special programs available for the implementation of development plans. Enrollment limited by the instructor. (Writing Assignments and Examination) (Spring—evening)

329 **Unfair Trade Practices** (3) Weston, Banzhaf, Schwartz, Schechter
Unfair trade practices at common law and under statutes; trademarks, trade names, copyright law; misappropriation of ideas; protection of competitors and consumers against false advertising under Federal Trade Commission Act; resale price maintenance under state Fair Trade Acts; state sales-below-cost statutes; Robinson-Patman Price Discrimination Act; miscellaneous business practices. (Examination) (Fall—day and evening)

330 **Federal Antitrust Laws** (3) Weston, Schechter
Sherman and Clayton Acts; related statutes. Price-fixing agreements and other types of trade restraints considered under Section 1; monopolizing considered under Section 2 of the Sherman Act. Mergers and tie-in sales, other activities under the Clayton Act. All types of business conduct raising questions under the antitrust laws, including trade association activities, exclusive-dealing arrangements, boycotts, patents, and copyrights. (Examination) (Fall—day, spring—day and evening)

331 **Product Liability** (2) Schwartz
Development of the concept of product liability and consumer's remedies. Specific problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with injuries and remedies in specific areas. (Choice of Research Paper or Examination) (Spring—evening)

332 **Federal Jurisdiction** (2) Lowther, Barron, Kayton, Raven-Hansen, Trangsrud
Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions, including problems of advisory opinions, standing to litigate, justiciability, federal questions in federal courts, federal review of state court decisions, including relation between state and federal substantive law; procedural problems in exercising review, application of law to fact. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Lowther—(Problem Assignments) (Fall—day; spring—day and evening)

334 **Advanced Criminal Procedure** (2) Starrs, Robinson, Zenoff
Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Starrs—Examination and Problem Assignments. Robinson, Zenoff—(Examination) Fall—evening)

335 Jurisprudence (2) Mayo, Park, Chandler
Basic jurisprudential concepts; nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic; law and justice; the judicial process; legislative, executive, administrative decision-making; impact of politics, economics, and scientific advance on legal systems; contemporary trends in jurisprudential thought. Mayo, Park—(Examination) Chandler—(Research Paper) (Fall—day and evening)

336 Taxation—Federal Income (3) Weaver, Solomon, Kempler, Sims
Survey of substantive provisions of federal income tax law, including concept of gross income; provisions affecting taxation of family and individual transactions; limitations on allowable deductions; sales and dispositions of property; problems of capital gains taxation; nontaxable exchanges. Weaver—Examination and Problem Assignments) (Fall and spring—day and evening; summer 1983)

338 Taxation—Federal Estate and Gift (2 or 3) Weaver
Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction, and split gifts; tax procedure. Examination. (Spring—day)

339 Collective Bargaining and Labor Arbitration (3) Merrifield, Rothschild, Seibel
Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 341. Merrifield, Rothschild—(Problem Assignments) (Spring—day and evening)

340 Taxation—Federal Income, Corporations and Shareholders (3) Solomon, Kempler, Sims
Continuation of Law 336. Primary emphasis on corporate–shareholder relationships. Problems of corporate dividends, redemptions of stock, distributions in partial and complete liquidation, stock dividends, bail-outs, and dividends in kind. Federal income tax problems involved in the formation of corporations, the sale of corporate businesses (including collapsible corporations), mergers and acquisitions, and corporate divisions. Students who have received credit for former Law 337 cannot receive credit for Law 340. Prerequisite: Law 336. (Examination) (Spring—evening)

341 Labor Law (3) Merrifield, Rothschild, Shieber
Law governing labor–management relations; organizations and representation of employees; regulation of economic weapons; enforcement of collective bargaining agreements; interunion and intra-union relations. (Examination) (Fall—day and evening)

342 Moot Court (1 or 2)
Satisfactory participation in the upper-class competition results in one hour of academic credit. Finalists in the upper-class competition receive two hours of academic credit. Finalists in the first-year competition receive one hour of academic credit. No academic credit is awarded to nonfinalists in the first-year competition. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

343 Law Students Civil Rights Research Council (LSCRRC) (2, 3, or 4) Sirulnik and Staff
Clinical problems concerned with the legal problems of minorities, women, and the poor. Students work with organizations such as the Lawyers Committee for Civil Rights Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Department, Institute for the Development of Indian Law, National Committee Against Discrimination in Housing, and National Senior Citizens Law Center. Approximately 60 hours of work per semester are required for each credit hour. The grade *CR* (Credit) or *NC* (No Credit) is given for this course.

Permission of the instructor is required prior to registration. (Fall, spring, summer)

344 Legal Writing (1 or 2) **Staff**

Preparation of a research paper under the supervision of a full-time member of the faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester-hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. See recommended guidelines under Regulations, Research Papers (Research Paper). (Fall and spring—as arranged; summer)

345 Law Students in Court (4) **Murphy**

A clinical program in trial advocacy, offering an opportunity to develop skills as a trial lawyer while representing indigent persons in the Superior Court of the District of Columbia. Students may participate in either the civil division, which focuses primarily upon the representation of tenants in landlord–tenant actions but also handles some consumer, negligence, and other civil matters, or the criminal division, in which student litigators defend persons charged with misdemeanor offenses. Students in both divisions have the opportunity for jury trials. They are responsible for all aspects of litigation under the supervision of clinical instructors, interviewing clients and witnesses, conducting investigations, preparing pleadings, engaging in settlement negotiations or plea bargaining, and conducting all motions hearings and trials pursuant to the Superior Court's third-year practice rule. Only third-year students who have completed Law 218, 215, and 232 may participate in the clinic. Seminars are held in the civil division on Monday evenings and in the criminal division on Wednesday evenings. Students must have one day per week available for court appearances and plan to devote approximately 20 hours per week to the clinic. Students must participate in the program for two consecutive semesters, beginning in either the summer or fall. Application must be made during the spring semester of the preceding academic year. This course may not be taken at the same time as Law 579 or any litigating activities in Law 346. Enrollment is limited, with selection by lottery. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, and summer)

346 Legal Aid (arr.) **Sirulnik and Staff**

(1) *Civil Administrative Law Clinic*—Working under the supervision of staff attorneys, students represent indigent litigants before state and federal administrative agencies. Activities include Social Security Disability hearings, Rental Accommodations Office hearings, Unemployment and Worker's Compensation hearings, Food Stamp reviews, will writing, and other public benefits program work. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration.

(2) *Immigration Clinic*—Clinical work includes representation of clients at deportation hearings, and oral argument before the Immigration and Naturalization Service Board of Immigration Appeals, and the U.S. Court of Appeals. Students will assist aliens residing in the Washington area with a wide variety of problems, including adjustment from nonimmigrant to immigrant status, obtaining labor certifications and work visas, obtaining visas for their relatives in other countries to enter the United States, and obtaining voluntary departure orders for those whose visas have expired and who are threatened with deportation. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor prior to registration. Successful completion of Law 586 suggested but not mandatory.

(3) *Outside Clinical Placement*—Students arrange independent projects with state or federal public interest organizations for academic credit. A compilation of suggested projects is available within the Community Legal Clinics office. Projects must receive prior approval by the Director of Clinical Programs or the staff.

(4) *Small Business Clinic*—Under guidance of the instructor, students assist small businesses and nonprofit organizations dealing with a wide variety of problems, including drafting partnership and incorporation papers, drafting and reviewing contracts and commercial leases, advising on tax problems, and resolving disputes. Prerequisite: Law 312 and 336. Permission of the instructor required prior to registration.

The grade *CR* (Credit) or *NC* (No Credit) is given for all sections of this course. (Fall, spring, summer)

347 Insurance (2) Schiller, Pock

A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Insurance marketing, insurable interest, subrogation, transfer of insurance benefits to nonpolicyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—day and evening; summer 1983)

348 Domestic Relations (2) Potts, Zenoff

Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Fall—evening; spring—day)

349 Community Property/Marital Property (2) Weaver

(Formerly Law 569)

Legal rules and planning considerations with respect to property owned and acquired by married persons. Primary emphasis will be on the law of the eight community property states, but special attention will also be given to the parallel problems seen under the now widely enacted statutes creating judicial power to decree an equitable distribution of a divorcing couple's marital property. As time permits, federal tax rules and considerations will also be discussed. (Research Paper or Examination) (Fall—evening)

351 Law and Accounting (2) Cibinic, Kempler, Taubman, Seligman

Study of fundamental accounting principles with emphasis on corporation accounting, legal and accounting implications of specific items in financial statements of corporations: inventory adjustments; corporate transactions; distributions; capital adjustments. Strongly recommended for students who have had no accounting. (Examination and Problem Assignments) (Fall—evening; spring—day)

355 Government Contracts (3) Nash, Cibinic

Survey of basic law underlying government procurement, basic power and limitations on federal government in entering into contracts, administrative and legislative policies governing these contracts, advertised and negotiated procurement procedures, forms of contracts and clauses used. Law 431 *Government Procurement Law* is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—day)

359 Patent Law (2) Kayton

Law of patents subsequent to issuance of patent: nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, utility and enablement, infringement, doctrine of equivalents, and file-wrapper estoppel. Substantive concepts introduced in an order approximating patentee's and infringer's cases in litigation. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

362 Patent Office Practice (2) Kayton, Sirilla

Substantive and procedural law of patents leading to issuance of patent, mainly related to proceedings before U.S. Patent Office. Obtaining and preserving earliest possible patent filing date; continuing applications, res judicata, novelty and nonobviousness requirements; substantive rules of priority of invention and related affidavit practice; nature of claims and formal defects; double patenting. Designed for students intending to specialize in patent law. Prerequisite: Law 359. (Examination) (Spring—evening)

363 **Fraud in Patent Practice** (2) **Kayton**
Procedural and substantive law of fraud and inequitable procurement in prosecution of patent applications before the U.S. Patent and Trademark Office. "Materiality," "reliance," and "scienter" criteria in fraud controversies; procedures used in motions to strike, and the striking of, patent applications in protests, reissues, and *sua sponte* proceedings of the Patent Office. Analysis of relationships among the New Reexamination Statute, Protests, the proposed Inter-Partes Protests, and the new-prior-art Reissues relative to fraud. For students intending to specialize in patent law. Prerequisite: Law 359 and 362. (Examination)

372 **Administrative Law** (3) **Park, Banzhaf, Barron, Schwartz, Raven-Hansen**
Study of the administrative process in executive and independent regulatory agencies; emphasis on judicial review. Formal and informal decision-making, investigation, planning, and public administration functions of the agencies as related to their legal limits and to the roles of lawyers in government and private practice. Relationships of agencies to the executive and legislative branches, to public and private interest groups, and to the social, political, and economic aspects of various philosophies of government regulation. Park and Banzhaf—(Examination). (Fall—day; spring—day and evening; summer 1983)

375 **Remedies** (3) Cibinic, Nash, Lowther, Park, Zubrow, Trangsrud
Development and use of judicial remedies that give relief for past or threatened injuries to interests of personalty and property. Remedial approaches include compensatory and punitive damages, injunctions, unjust enrichment, constructive trusts, equitable liens, tracing, subrogation, and specific reparation. Emphasis on comparing remedial options in fraud, mistake, duress, breach of contract, and abuse of fiduciary relationships. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Cibinic—(Examination). Lowther, Nash—(Problem Assignments). (Fall and spring—day and evening; summer 1983)

377 **Legislation** (2) **Zenoff**
Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination)

380 **Advanced Legal Writing Seminar** (2) **Zenoff**
Constitutional law, criminal law, and psychiatric aspects of criminal offenders are the central themes from which paper topics will be selected for this seminar. Instruction in improving skills in such areas as legislative research, use of interdisciplinary materials, editing and critiquing manuscripts. The seminar fulfills the advanced legal writing requirement. (Spring—day)

385 **Trial Practice Court** (2) **Pryor, Ryan, Kendrick, Stern-Boswell, Stevas, Altshuler, Seidel, Barnes**
Trial of assigned cases; trial techniques; pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite: 42 semester hours, including Law 218. Prerequisite or concurrent registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day and evening)

388 **Appellate Practice and Procedure** (2) **Markey**
Study through text and an examination of the appellate process. The course is centered around the discussion of a series of fundamental concepts. Research paper. (Fall—day)

389 **Medicine for Lawyers** (2) **Hirsh**
Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation

as well as in commitment and equitable proceedings. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. Examination. (Fall and spring—day)

390 Law and Medicine (2) Sharpe, Fiscina

Malpractice insurance and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions; professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. Examination. (Fall—evening)

394 Women and the Law (2) Polikoff

An examination of the treatment of women in all areas of the law and legal remedies for sex discrimination. Emphasis on constitutional law, criminal law, discrimination in the media, education, and employment. Students choose clinical projects or research papers on which to focus the semester's work. Enrollment limited to 30 students. Research Paper. (Spring—day)

395 Problems of the Consumer (arr.) Rothschild and Staff

(*Formerly Law 459*)

(1) *Consumer Protection Center*—Clinical treatment of consumer protection. Students engage in one or more of a number of the Center's projects. For example, "Consumer 9" is a project that solves problems received in writing or by telephone for a nightly television show. "Consumer H-E-L-P" places students in telephone contact with inner-city consumers. The cluster intern program places law students with the District of Columbia Office of Consumer Protection. The Center's federal programs allow students to gain experience in regulatory agencies. Students may also write and publish in the *Consumer Protection Reporting Service*. Minimum of 8 hours work commitment each week. 2-hour weekly seminars required in addition for 3 credits. May be repeated once for a total credit not to exceed 6 hours.

(2) *Bankruptcy Clinic*—Open to second- and third-year students. Students participate in negotiations with creditors, counsel clients in financial matters through intensive interviews, and prepare legal petitions in bankruptcy that may be necessary to assist clients. May be taken for 2 or 3 credits. One and one-half hour weekly seminar.

The grade *CR* (Credit) or *NC* (No Credit) is given for both sections of this course. (Fall, spring, and summer—day)

396 Legal Activism (2 or 3) Banzhaf

Study of the legal process not to benefit individual clients, but as a powerful tool for affecting social change and advancing the public interest. Topics discussed in a 2-hour seminar meeting each week include: principles of maximizing legal leverage; legal judo; guerrilla law; working with the press and members of Congress; drafting of legal documents; unusual legal tools and tactics; negotiation; making money from public interest law; etc. Students may choose to bring a public interest legal action before an agency or in court or may undertake another legal action project for 3 credits and receive a numerical grade. Alternatively, students may do research on a topic related to public interest law for 2 credits on a *CR/NC* basis. (Fall—day)

397 Disabled People and the Law (2) Banzhaf

Examination of those areas in which persons with disabilities have traditionally been denied some right or benefit afforded other persons in our society and have resorted to legal action; introduction to statutes and agencies designed to protect people with disabilities. Students may choose to prepare a research paper (and receive legal writing credit and a numerical grade), or to gain practical experience doing a clinical project (on a *CR/NC* basis). (Spring—day)

398 **National Center for Law and the Deaf** Banzhaf
Clinical Education Activities (1, 2, or 3)
Work with the National Center for Law and the Deaf in bringing legal information, services, and representation to the more than 13 million Americans who are deaf or hearing-impaired. The Center is designed to help make the hearing-impaired aware of their legal rights and to assist them in solving their legal and law-related problems. Students may participate in one or more projects: (1) counseling persons with hearing impairments about legal problems at a walk-in clinic usually held on the Gallaudet College campus; (2) preparing and participating in workshops for hearing-impaired persons to acquaint them with their rights and obligations under the law; (3) assisting in representing the interests of deaf and hearing-impaired persons in judicial and administrative proceedings; (4) preparing research papers on topics related to law and the deaf or preparing handbooks explaining legal topics to the hearing impaired. Students may learn some sign language but will be assisted by trained translators when dealing with deaf individuals. Approximately 60 hours of work per semester is required for each credit hour. Students may repeat this course for a maximum of 8 semester hours of credit. This course may not be taken at the same time as Law 345 or any litigating activities in Law 346. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

399 **Clinical Law Work** (arr.) Staff
Projects involving litigation, research, or public interest activities of a legal nature including aid to indigents, support of public interest nonprofit corporations, and support of governmental agencies or courts) may be initiated and will be supervised by a faculty member. Projects must be approved in advance by the Law Center Supervisory Committee (three members) both as to whether the project is appropriate and as to the number of semester hours of credit to be granted. A maximum of 10 semester hours of credit may be taken in one or two semesters. This course is open to a limited number of third-year law students. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

CLINICAL LEGAL STUDIES

Director: E.S. Sirulnik

Faculty Advisers: D.P. Rothschild, E.S. Sirulnik, J. Banzhaf III, A.W. Reitze

Related Courses

343 *Law Students Civil Rights Research Council (LSCRRC)*
345 *Law Students in Court*
346 *Legal Aid*
395 *Problems of the Consumer*
396 *Legal Activism*
398 *National Center for Law and the Deaf*
399 *Clinical Law Work*
513 *Environmental Litigation*
516 *Clinical Studies in Environmental Law*
579 *Clinical Studies in Urban Law*
596 *Graduate Clinical Studies*

ADVANCED COURSES

ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers: R.E. Park, G.E. Weston

401 Administrative Law Seminar (2) Harris
Group study of specific problems in administrative law. Topics will vary. In the fall 1983 semester, the course will focus on policy management and development. Prerequisite: Law 312. (Research Paper) (Fall—day)

403 Public Economic Policy and the Law (2) Peterson
Interrelation of law and economics in such subject-matter categories and decisional contexts as economic regulation of industry, fiscal policy planning, government research and development practices, foreign trade and investment, and public spending priorities. (Research Paper) (Spring—evening)

404 Securities Regulation (3) Green, Seligman, Black, McCaw
The basic course in the study of federal and state laws governing the offering, distribution, and trading of securities. Focus on federal laws and regulations, in particular the Securities Act of 1933, the Securities Exchange Act of 1934, and the enforcement of these laws by the SEC and private parties. (Examination) (Spring—day and evening)

405 Regulation of Securities Markets (2)
Operation of over-the-counter and exchange markets, including competitive and monopolistic practices in each market; relationship of antitrust laws and securities regulations to concept of a free and open market place; role of regional exchanges and third market in providing competitive element in market; advantages and disadvantages of a fragmented market; minimum fee structure; rebates and their effect on merchandising of securities and financial soundness of industry; use and availability of economic data in evaluating performance of market place. The seminar will examine matters directly of interest to graduate law students, lawyers, economists, and political scientists. (Take-home Examination)

407 Seminar: Law and Economic Development (2)
An investigation of legal problems relevant to economic development in the Third World. Economic aspects of economic development; principal issues relating to the impact of domestic laws on economic development; private legal aspects of transactions that may assist in economic development; and some of the principal policy issues in the so-called North–South dialogue. Discussion of student research papers may play a major role in the organization of the class. (Research Paper)

408 Seminar: Health Care Delivery Systems (2) Steele, Tillman
Study of the role of the lawyer in existing and proposed national systems for delivering health care. Students will gain familiarity with the concepts and terms in health care delivery by working with issues in the design, finance, and administration of existing arrangements; examination of the means of reconciling the expectations of various groups of health care service consumers and providers. (Research Paper) (Spring—evening)

411 Administrative Practices and Procedures (Food and Drug Administration) (2) Rothschild, Horton
The study of FDA administrative procedures for the purpose of investigating the significance that administrative practice has on regulatory activity. The course will consider FDA rulemaking procedures in general, a step-by-step consideration of the various hearing procedures now available under the new agency practices and procedures, and problems designed to enable the practical application of rulemaking and hearing procedures to achieve resolution. Prerequisite: Law 372. (Research Paper) (Fall—evening)

412 **Food and Drug Law** (2) Kaplan, Becker
The Federal Food, Drug, and Cosmetic Act and related laws. Consumer, government, and industry viewpoints. (Choice of Research Paper or Examination) (Spring—evening)

413 **Public Policy and Mass Media** (2) Barron, Plesser, Hammer
Institutional structure of mass media and their interrelationships; psychological aspects of mass communications; continuing adjustments among public interest goals, the economic system, and technological developments; influence of and controls exercised by government, other institutions, and private groups; conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these groups to the media. (Examination or Research Paper) (Fall—day; spring—evening)

414 **Regulated Industries** (2) Park, Schechter
Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper)

415 **Practical Economics for Lawyers** (2) Raven-Hansen
For students with no prior economics training. No calculus or statistics is required. Key principles of economic theory are presented, with focus on the application of these principles to antitrust, regulatory impact analysis (including environmental cost/benefit analysis), utility ratemaking and regulation, and deregulation. The course also considers preparation and examination of economic expert witnesses in these areas of the law. (Examination)

417 **Seminar: Trade Regulation** (2) Weston, Bodner
Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper) (Spring—day)

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
372 *Administrative Law*

Other Related Courses

328 *Land Use Control*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
518 *Use and Control of Nuclear Energy*

CORPORATION LAW

Faculty Advisers: R.B. Stevenson, Jr., L.D. Solomon

424 **Business Planning** (2) Green, Flyer, Lewis, Berkeley, Press, Cohen, Parker
Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corpora-

tion; stock dividends; recapitalization; and stock purchases in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 312, 336, and 340. Enrollment may be limited by the professor. Berkeley Press—(Problem Assignments; Flyer, Lewis, Cohen, Parker—Examination) (Fall and spring—day and evening; summer 1983)

426 **Introduction to International Economic Law** (2) Hertzberg, Benson
An introductory survey of U.S. trade law, the international trade law system and involved organizations, U.S. trade policy and its formulation, the interaction of domestic political developments on U.S. international trade law and policy and its administration, an introduction to international investment issues, and the international monetary system. Emphasis will be on trade and its interaction with other topics considered. (Examination) (Fall—day)

427 **Legal Aspects of International Business Transactions** (2) Iwry, Kolo
U.S. law and practice relating to the formation and dissolution of international business agreements; brief treatment of other common and civil law systems; multinational codes and multilateral agreements; U.S. and developing country regulation of foreign investment; concession, licensing, distributorship, and financial agreements; sources of finance; transnational reach of U.S. legislation including taxation; antitrust; foreign payments; protection of foreign investment; exhaustion of local remedies and espousal; nationalization of investments; sovereign immunity; litigation in a transnational setting, including choice of law and forum, jurisdiction, discovery, enforcement; arbitration. Occasional guest lecturers. Emphasis on current problems. (Examination) (Spring—evening)

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

312 *Corporations*
313 *Sales and Sales Financing*
329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
340 *Taxation—Federal Income, Corporations and Shareholders*

Other Related Courses

331 *Product Liability*
403 *Public Economic Policy and the Law*
404 *Securities Regulation*
407 *Seminar: Law and Economic Development*
417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
525 *Copyright Law*
526 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*
555 *Taxation—Special Corporation Problems*
562 *Income Taxation of Foreign Business and Investment*

GOVERNMENT PROCUREMENT LAW

Faculty Advisers: J. Cibinic, Jr., G.J. Ginsburg, R.C. Nash, Jr.

431 **Government Procurement Law** (4) Nash, Cibinic
Survey of the law pertaining to government procurement, including an analysis

of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in the procurement process. The course focuses on the contract formation process, including techniques for awarding contracts and litigation and protests involving awards. Law 355 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall—evening)

432 **Performance of Government Contracts** (4) Nash, Cibinic
Discussion of the substantive problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses; analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. Analysis of the methods that can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure; actions for breach of contract; and forms of equitable and extraordinary relief. (Examination and Problem Assignments) (Spring—evening)

435 **Seminar: Government Contracts** (2) Nash, Cibinic
Research and discussion of selected problem areas. (Research Paper) (Spring—day)

Other Related Courses

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
332 *Federal Jurisdiction*
339 *Collective Bargaining and Labor Arbitration*
340 *Taxation—Federal Income, Corporations and Shareholders*
341 *Labor Law*
359 *Patent Law*
424 *Business Planning*
427 *Legal Aspects of International Business Transactions*
442 *Labor Standards*
446 *Equal Employment Opportunity*
450 *Equal Employment Claims and Litigation*
505 *Intergovernmental Relations I*
508 *Environmental Law I*
518 *Use and Control of Nuclear Energy*
535 *Negotiation: Concepts and Techniques*
585 *Computers and the Law*
591 *Legislative Drafting*

LABOR LAW

Faculty Advisers: J.M. Albert, L.S. Merrifield, D.P. Rothschild

440 **Seminar: Comparative Labor Law** (2) Merrifield
A comparison of different systems for the regulation of labor and industrial relations in selected countries. Group study of how common problems are handled under these systems. Topics may include legal status of collective agreements; worker participation in decision-making; limits on bargaining weapons; procedures for settlement of grievances and jurisdictional disputes; protection against unfair dismissal; and reconciliation of individual, minority, and majority group interests. Prerequisite: Law 341 or equivalent. (Research Paper) (Fall—day)

441 **Seminar: Disability Problems** (2)
Worker's compensation law; extension of no-fault principle into motor vehicle area; and national health problems. (Examination)

442 **Labor Standards** (2) Ginsburg
Analysis of the Fair Labor Standards Act, its scope and exemptions; the Civil

Rights Act and other labor statutes, the laws establishing labor standards for government contracts, including the Davis–Bacon Act, Walsh–Healey Act, Service Contract Act and Work Hours Act; the role of the Department of Labor, the Comptroller General, and the contracting agencies in interpretation, administration, and enforcement of these statutes. (Examination) (Spring—evening)

443 Labor Relations in the Federal Service (2) Tobias
Study of the Civil Service Reform Act with emphasis on the structure and case law developed by the Federal Labor Relations Authority, Federal Service Impasses Panel, and Merit Systems Protection Board. Parallels are drawn between federal sector, non-federal public sector, and private sector decisions. (Research Paper) (Fall—evening)

444 Internal Union Affairs (2) Shieber
(*Formerly The Individual and The Union*)
Study of the legal relations between unions and their members with special emphasis on the right to fair representation, the right to union membership, compulsory union membership, the imposition of discipline upon union members, reporting requirements, the conduct of internal union elections, the fiduciary duties of union officers, the imposition of trusteeships, the regulation of racketeering, and political action of unions. Prerequisite: Law 341. Examination. (Fall—evening)

445 National Labor Relations Board Procedures (2) DuRoss
A survey of the National Labor Relations Board's unfair labor practice procedures. The course is designed to provide a broad exposure to all aspects of the National Labor Relations Board's practice, including a survey of the remedies and the particular procedures used to secure remedies. Prerequisite: a basic labor law course. Research Paper. (Fall—evening)

446 Equal Employment Opportunity (2) Silberman, Shieber
This course covers the spectrum of federal laws and executive orders relating to all types of discrimination in employment, including Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the National Labor Relations Act; Executive Orders 11246 and 11375 relating to government contractors (including the "Philadelphia Plan" and other government-imposed "affirmative action" plans and bid conditions, and Revised Order No. 4 relating to sex discrimination). Substantive and procedural rights available to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. Examination. (Fall—evening; spring—day)

447 Seminar: Labor Law (2) Merrifield
Group study of contemporary problems of labor law. Prerequisite: Law 341. (Research Paper) (Spring—day)

448 Seminar: Labor Litigation (2) Dreesen
Examination of the Supreme Court's work in the labor law field, with emphasis on current and recently decided cases. Facets of Supreme Court practice and procedure that bear upon labor litigation, litigation strategies and objectives of institutions and practitioners who practice labor law before the Supreme Court. Each student will study intensively the labor relations opinions of an individual Justice, followed by participation in a mock conference of the Justices on a pending or recent case and preparation of a paper analyzing the Justice's views on important labor law issues. Prerequisite: Law 341. Research Paper. (Spring—evening)

450 Equal Employment Claims and Litigation (2)
Litigation in federal court of a claim of employment discrimination, problems faced by attorneys for both plaintiff and defendant; practice in drafting pleadings that the attorneys for the parties would prepare in litigating a claim of employment discrimination. (Examination) (Spring—evening)

451 **Occupational Safety and Health Legislation (OSHA)** (2) Savelson
A review of the history of safety and health law in the United States and an analysis of the interrelationships of various federal and state safety and health laws. The focal point will be the Occupational Safety and Health Act of 1970. By use of commission and court decisions, the course will survey the jurisdictional applicability of the Act and the responsibilities imposed thereunder; analysis of enforcement and adjudicative procedures. (Examination) (Fall—evening)

452 **Seminar: Public-Sector Labor Law** (2) Nassau, Shieber
Group study of contemporary problems of labor law. The course is devoted exclusively to problems of the public sector. (Research Paper) (Spring—day and evening)

Master of Laws candidates in the area of Labor Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

339 *Collective Bargaining and Labor Arbitration*
341 *Labor Law*

Other Related Courses

395 *Problems of the Consumer*
566 *Taxation—Deferred Compensation II*

LAW, PSYCHIATRY, AND CRIMINOLOGY

Faculty Advisers: T.F. Courtless, Jr., E. Zenoff, G.M. Caplan

473 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer** (2) Starrs, Melson
Designed to acquaint the student with the operations of a modern crime laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology); identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper); toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems, and drug law enforcement. Visual aids, crime laboratory guest lecturers, and field trips to crime laboratories. (Research Paper) (Spring—day)

475 **Law and Criminology I: Search for the Causes of Criminal Behavior** (2) Courtless
The role that criminological knowledge of crime causation may play in assisting lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such causal theories. (Research Paper) (Fall—day)

476 **Law and Criminology II: Society's Responses to the Criminal Offender** (2) Courtless
Study of the development and current use of society's three major approaches to the handling of offenders: punitive, mechanical, and correctional. Emphasis on society's changing responses to criminal and delinquent behavior; research findings concerning effectiveness of these responses. Analysis of treatment strategies to facilitate communication between members of the legal profession and behavior scientists charged with effectuating these strategies. Prerequisite: Law 475. (Research Paper) (Spring—day)

477 The Police and the Community (2) Courtless
Problems and potential of contemporary urban law enforcement: the role and perspective of the police officer, the police *qua* organization, styles of law enforcement, law enforcement in the inner city, relationship with ethnic minorities, civil disorder, police–community relations, methods in arrest and investigation; complaint review procedures, science and technology in law enforcement; police handling of juveniles; crime and crime statistics. (Problem Assignments)

479 Seminar: Criminal Practice (2)
Tactical and practical applications of criminal law, mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases, student role-playing as defense attorneys and prosecutors. All phases of criminal trial work are covered—client relations, investigation, discovery, trial preparation, particular emphasis on courtroom techniques—direct and cross examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense viewpoint, techniques taught are relevant to both prosecution and defense. Enrollment limited to 15 third-year and graduate students. Prerequisite: Law 334. Students may elect to receive either a numerical grade or the grade *CR* (Credit) or *NC* (No Credit). Cripe

480 Law of Criminal Corrections (2)
Study of two principal areas: sentencing procedures (including probation, parole, and imprisonment) and legal rights of prisoners. Enrollment limited to 25 students. (Examination) (Fall—evening)

481 Seminar: Drugs and the Law (2) Sirulnik, Meyers
A study of federal and state laws controlling illicit drugs, including the historical evolution of these laws, current offenses and penalties, constitutional limits on the criminal sanction, enforcement practices, and sentencing considerations. Alternative models for controlling drugs, including decriminalization and legalization. Five class sessions will be devoted to mock criminal trials at which student teams conduct direct and cross examination of guest expert witnesses in the field. Graded on the basis of assigned memoranda pertaining to the legal issues involved in the mock hearings. (Writing Assignments) (Spring—day)

486 Seminar: Law and Psychiatry (2) Zenoff
Designed to expose the lawyer to basic constructs of psychiatry and psychology and to explore their implications in legal rules and practice. Psychiatrists and psychologists actively involved in teaching process. Topics include psychological testing and other assessment techniques, psychiatric evaluations and reports, child custody and other family law issues, privilege and confidentiality, competency in civil and criminal contexts, criminal law matters (including criminal responsibility and dispositional issues), civil commitment, right to treatment, right to refuse treatment, experimental procedures, and informed consent. Problems of counseling, legal ethics, preparation for trial, direct and cross examination, and other aspects of practice considered. There is ordinarily at least one session in a mental institution. (Choice of Research Paper or Examination)

487 The Child, The Family, and The State (2) Zenoff
(Formerly Juvenile Justice)
The rights of children, particularly in the family and criminal law area, are the focus of this course. Among the subjects covered are child custody, support, medical treatment, neglect, status offenders, and delinquency. (Examination) (Fall—day)

492 Seminar: Science and the Legal Process (2) Green
Reciprocal relationships between law and science, absorption of scientific concepts into substantive law through adjudication, legislation and rule-making techniques and procedures used in handling, developing, and deciding scientific issues. (Research Paper) (Spring—evening)

Other Related Courses

390 *Law and Medicine*
591 *Legislative Drafting*
592 *Seminar: Constitutional Law*

LAND USE MANAGEMENT AND CONTROL

Faculty Advisers: J.M. Brown, L.A. Schiller, J.P. Chandler

501 Land Development Law (3) Brown
(Simulation course)
Study of the basic public and private means used by society to manage and control land use, such as zoning, subdivision regulation pending codes, eminent domain, and privately contracted conditions, covenants, and restrictions. Identification and analysis of emerging new land control processes and the roles played by public and private entities involved in or affected by land use management and control efforts at the various echelons of government. Students participate in a game-simulation process representing a specific complex situation in land use conflicts involving their inherent technological, social, economic, political, and legal elements. In the model situation students will assume roles as attorneys and work with assigned "clients." (Client-oriented written work and class participation). Enrollment limited by the instructor. (Fall—day; summer 1983)

502 Banking Institutions and Their Role in Real Estate Investments (2) Schaumber
History of the American banking system; review of the Federal Reserve System and Federal bank regulatory agencies; regulation of traditional banking activities; examination of the Bank Holding Company Act; history of savings and loan associations; restrictions and expanding scope of branch banking; mergers and acquisitions; role of each institution in financing real estate acquisitions and development. (Examination) (Spring—evening)

504 Seminar: Current Problems in Land Use Controls (2) Brown, Schiller
New and emerging concepts of regionalism considered in the light of actual problem situations and attempts being made by various echelons of government to provide effective and equitable land use management and control. Examination of actual problem areas of major concern, including constitutional, administrative, political, judicial, social, economic, and technological elements. Functional planning and decision-making with respect to selected problem areas and their strategical and tactical transactions within the compass of the broader policy considerations involved. Guest lecturers, clinical exposure to a number of appropriate government agencies. (Research Paper) (Spring—day)

505 Intergovernmental Relations I (2) Nash
Study of federalism, emphasizing current techniques for achieving cooperation and coordination between federal, state and local governments. Detailed consideration of devices used, including interstate compacts, grants-in-aid, and exercise of regulatory powers. (Research Paper)

506 Intergovernmental Relations II (2) Nash
Advanced seminar on multi-government activities and current topics on intergovernmental relations. (Research Paper)

Master of Laws candidates in the area of Land Use Management and Control who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

327 *Modern Real Estate Transactions*
372 *Administrative Law*

508 *Environmental Law I*
509 *Environmental Law II*

Other Related Courses

328 *Land Use Control*
510 *Water Resources Law*
511 *Environmental Planning*
518 *Use and Control of Nuclear Energy*
558 *Taxation—Real Estate and Income*
560 *Taxation—State and Local*
591 *Legislative Drafting*
593 *Seminar: American Legal History*

ENVIRONMENTAL LAW

Faculty Adviser: A.W. Reitze, Jr.

508 Environmental Law I (3) Reitze
An introductory course focusing on the statutes administered by the Environmental Protection Agency. Topics covered include water pollution, hazardous material control, toxics, pesticides, noise, and radiation. (Examination) (Fall—day)

509 Environmental Law II (3) Reitze
An in-depth analysis of the Clean Air Act, focusing on legal problems common to environmental law. Topics covered include standard setting, technology-based controls, development of pollution control plans, monitoring, inspection, enforcement, economic controls, energy trade-offs. (Examination) (Spring—day)

510 Water Resources Law (2) Hedeman
Federal and state powers over water, riparian and prior appropriation doctrines, Indian and reserved rights, groundwater law. Federal programs for water resources development, federal permit programs, Wetland protection and coastal zone management. Recommended as an introductory course. (Examination) (Fall—evening)

511 Environmental Planning (2) Kussy
Administrative law issues, the National Environmental Policy Act, historic preservation, parkland protection, coastal zone management, river basin and floodplain planning, comprehensive transportation planning, state environmental planning laws, mitigation requirements. (Research Paper) (Spring—evening)

512 Energy (2) Hollis
Survey of federal regulation of the major energy industries. Emphasis on federal controls affecting the natural gas, coal, oil, synthetic fuel, and electric industries. The course approaches energy regulation from a statutory and case standpoint, and also deals with practical, procedural issues. Enrollment is limited to 35 students. Recommended for third-year students. (Examination) (Fall—evening)

513 Environmental Litigation (2) Vitt, Disheroon
Special problems of environmental lawsuits. Topics include pleadings, procedural problems, selection of the proper court, problems of proof, remedies, selection of parties, discovery techniques, obtaining temporary restraining orders and preliminary injunctions, trial preparation, and use of expert witnesses and scientific evidence. Prerequisite: third-year or graduate status. Recommended for students who have taken at least one environmental law course. Enrollment limited to 35 students. (Writing Assignments) (Spring—evening)

514 **Natural Resources Law** (2) Kirby
Introduction to federal public lands and their multiple uses: forestry, grazing, water, mining, fish and wildlife, recreation, and preservation. Principles of Congressional and state authority over these lands. Endangered Species Act and wildlife refuges. The Wilderness Act and the National Park System. Class focus on topical case studies and statutory materials. Recommended as an introductory course. (Examination) (Fall—evening)

515 **Pollution Control Law** (2) Buente
A detailed analysis of federal regulation of water pollution, hazardous waste, and toxic substances. Intensive examination of sewage construction grants process and toxic effluent controls under the Clean Water Act and hazardous waste handling, disposal, and clean-up under the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act. Other statutes covered include the Toxic Substances Control Act, Safe Drinking Water Act, and Federal Insecticide, Fungicide, and Rodenticide Act. Recommended for third-year and graduate students. Prerequisite: Law 508. Law 510 and 372 (or another basic administrative law course) are recommended prior to taking this course. (Examination) (Spring—evening)

516 **Clinical Studies in Environmental Law** (2, 3, or 4) Reitze
The student works on a project in the environmental law field under the supervision of both the faculty director of the program and a lawyer practicing environmental law. The project may involve working with a government agency, a Congressional committee, a private practitioner, or a nonprofit public-interest environmental organization. Admission to the course requires second-semester second-year, third-year, or graduate standing and permission of the Director of the Environmental Law Program. Students who have mastered the fundamentals of environmental law are selected for this course. Normally this will require completion of at least Law 508. Students may repeat the course for a maximum of 8 semester hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Five hours of work per week are required for each credit. (Fall and spring—day)

517 **Control of Toxic and Hazardous Substances** (2)
Analysis of the federal and state laws and regulatory schemes relating to the control of toxic and hazardous substances. Federal laws to be examined include the Toxic Substances Control Act, the Resource Conservation and Recovery Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund"). Common law as it relates to toxic control; administrative and institutional problems associated with the control of toxic and hazardous substances. Research Paper. (Spring—evening)

518 **Use and Control of Nuclear Energy** (2) Malsch
Analysis of the legal framework for regulation of nuclear energy in the United States and for dealing with proliferation of nuclear weapons abroad. Discussion of substantive technical and policy issues relating to nuclear power reactor safety, disposal of radioactive waste, and safeguarding nuclear installations against domestic nuclear terrorism. Focus of the legal discussion is on the U.S. Nuclear Regulatory Commission. Includes such topics as Federal preemption, impact of the National Environmental Policy Act of 1969, conduct of adjudicatory hearings under the Administrative Procedure Act, compensation for injuries from nuclear accidents, and prelicensing antitrust reviews. (Research Paper) (Spring—evening)

Individual Research

344 *Legal Writing (J.D. candidates)*
598 *Research in Public Law (Master's candidates)*
599–600 *Thesis*

Other Related Courses

302 *Admiralty*
327 *Modern Real Estate Transactions*
372 *Administrative Law*
401 *Administrative Law Seminar*
403 *Public Economic Policy and the Law*
408 *Seminar: Health Care Delivery Systems*
412 *Food and Drug Law*
414 *Regulated Industries*
415 *Practical Economics for Lawyers*
431 *Government Procurement Law*
451 *Occupational Safety and Health Legislation*
531 *International Law of Air and Space*
532 *International Law of the Sea*
559 *Taxation—Oil and Gas*
560 *Taxation—State and Local*
591 *Legislative Drafting*

PATENT AND TRADE REGULATION LAW

Faculty Advisers: I. Kayton, G.E. Weston

521 **International and Comparative Patent Law** (2) Schwab
Origin of patent laws. Patent systems of major countries—United Kingdom, France, Germany, USSR, and others. Comparative topical survey: kinds of patents, inventors and applicants, subject matter, novelty, administrative procedures, oppositions, revocation, renewal fees, compulsory licensing, infringement, etc. International Convention for the Protection of Industrial Property: origin, membership, organization, substantive provisions. Treaties in the making. Common Market patent system. Nordic Patent. Patent Cooperation Treaty. Council of Europe activities. Prerequisite: Law 359 and 362. Examination. (Spring—evening)

522 **Patent and Know-how Licensing** (2) Brumsfield
The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his or her status as the owner of a unique form of property. Subject areas covered are: business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 359. Choice of Research Paper or Examination. (Spring, odd years—evening)

524 **Chemical Patent Practice** (2) White
Seminar covering patent application preparation, prosecution, appeals, and licensing particular to chemical patent practice. Prerequisite: Law 359 and 362, or comparable experience in the practice of patent law. Examination. (Fall, even years—evening)

525 **Copyright Law** (3) Moore
Historical background; formalities and essentials in securing a copyright; subject matter of copyright; remedies; international aspects of copyright under Berne Union, Universal Copyright Convention, Inter-American Convention; copyright licensing and performing rights societies. (Examination) (Spring—evening)

526 **U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks** (2) Hefter
Procedural and substantive law on use, registration, and protection of trademarks, including detailed registration procedure in the U.S. Patent and Trademark Office, common law rights to marks, and licensing and franchising arrangements. Prerequisite: Law 329 (Examination) (Fall, odd years—evening)

527 **Advanced Topics in Patent Law** (2) Kayton
Seminar directed to selected, advanced, and usually topical aspects of patent law. Topics may include the Re-examination Statute of 1981, procedure in patent infringement appeals to the U.S. Court of Appeals for the Federal Circuit, patent and copyright protection of living microorganism and genetically engineered sequences, fraud in patent practices, and advanced aspects of practice before the U.S. Patent and Trademark Office, including inter partes interference practice. Prerequisite: Law 359 and 362. (Research Paper) (Fall—evening)

528 **Patent Interference Practice** (2) Klitzman
Procedure and practice in inter partes determination of priority of invention in the U.S. Patent Office. Topics: conception, reduction to practice, diligence, corroboration, preliminary statements, motions, and testimony practice and final hearing. Also covered are current problem areas such as inventor determination, discovery, and privilege. Students are required to draft procedural documents selected from categories of preliminary statements and various interference motions. Prerequisite: Law 359 and 362. (Examination)

529 **Research in Patent, Trademark, and Copyright Law** (2) Kayton
Prerequisite: Law 359, 362, and related courses, and a *B* average. Request in writing, with proposed outline of topic of research, must be submitted to the Dean at least one month prior to registration day. Work must be completed within the semester and paper submitted not later than the last day of classes. Graduate students may repeat this course once for credit with the approval of the Dean. (Research Paper)

Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
359 *Patent Law*
362 *Patent Office Practice*

Other Related Courses

417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
585 *Computers and the Law*
589 *Seminar: Law of Privacy*

INTERNATIONAL AND COMPARATIVE LAW

Faculty Advisers: International Law—W.T. Mallison, P.R. Harris
Comparative Law—W.T. Mallison

The basic courses for the International and Comparative Law Program are Law 303, *International Law and World Order*, and Law 304, *United Nations Law and World Order*. Either of these courses provides an important background for the following advanced seminars. Law 307, *Comparative Law*, is also recommended for background.

531 **International Law of Air and Space** (2) Dembling, Hosenball
Study of the development of international law related to the use of air space and outer space; analysis of air and space treaties in force, the role of various intergovernmental and nongovernmental international organizations, consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space earth resources, sensing, etc. Enrollment limited to 25 students. (Research Paper) (Fall—evening)

532 **International Law of the Sea** (2) Doyle
International law affecting allocation of authority over ocean space. Development of international law concerning territorial sea, contiguous zone, high seas, continental shelf, and deep seabed. Current legal and policy issues associated with these areas. (Examination) (Spring—evening)

533 **International Humanitarian Law of Coercion Control** (2) Mallison
Process of legal decision concerning international conflicts and civil wars including the protection of war victims, control of international terrorism problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, the role of the International Committee of the Red Cross, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)

534 **U.S. Foreign Relations Law** (2) Chandler
Seminar involving the study of foreign relations law. Materials to be read and discussed relate to the Constitutional and other public law problems that arise in the development and conduct of U.S. foreign relations. (Research Paper)

535 **Negotiation: Concepts and Techniques** (2) Ramundo, Tankel
Roles of the attorney–negotiator and principal (client) in the private, intraorganizational, and international negotiating environments; the "think negotiation" mentality and a suggested conceptualized approach to the negotiation process including the definition of negotiation, four phases of negotiation, and operational checklists; negotiating techniques, including presentational considerations and the use of persuasion, tactics and ploys, and classic do's and don'ts lists; theories of the opening position and concession-making. Practical exercises in the actual conducting of negotiations. Enrollment limited by the instructors. (Writing Assignments) (Spring—evening, summer 1983)

536 **Diplomatic and Consular Law and Practice** (1)
Development of diplomatic and consular relations between nations; legal rights, privileges, functions, and immunities of diplomatic and consular personnel; extent of immunity from jurisdiction of foreign government missions and representatives; problems of taxation affecting foreign government missions and personnel. (Research Paper)

537 **The International Law of Human Rights** (2) Fruchterman
Development of the rights of man from Grotius through the American and French Revolutions to the work of the United Nations in the field of human rights; the individual vis-a-vis the State; the regional approach to international protection of human rights, with emphasis on the European Convention; the inter-American, African, and Socialist approaches; human rights in armed conflict; and terrorism as a basic deprivation of human rights. (Research Paper) (Fall—evening)

542 **U.S. Regulation of International Trade** (2) Johnston
Study of theory and practical application of United States laws, regulations, and governmental infrastructure affecting international trade. Public international forums and agreements influencing U.S. regulation, e.g., GATT, the MTN, UNCTAD, and treaties of friendship, commerce, and navigation; constitutional basis for U.S. government regulation of international trade; exemplary areas of

trade regulation: Export Administration Act, foreign assets control, tax, Foreign Corrupt Practices Act, Arab boycott regulations, antitrust, countervailing duties, import relief for domestic industries, East–West trade, generalized system of preferences, and tariff nomenclature. (Examination) (Spring—evening)

546 **Soviet Law** (2) **Ramundo, Tankel**

Concept of "socialist legality," legal relationship of individual to state and other participants in Soviet society; role of Party in Soviet legal system; Soviet philosophy of law; state (constitutional) law; Soviet federalism, governmental apparatus, rights and obligations of citizenship; criminal law; property law; labor law, selected topics in civil law and procedure; international law. (Research Paper or Examination) (Fall—evening)

547 **Chinese Law** (2) **Hsia**

Emphasis on the legal system of China; analysis of the constitutional law of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counter-revolutionary act and other criminal statutes; principles of civil law; Chinese concept of international law. (Research Paper) (Fall—evening)

548 **Law of the Near East** (2) **Jabri**

Law of the Arab countries, Turkey, and Iran, including basic principles of Islamic law; analysis of the present day codes, and investigation of Western influences on laws of these countries. (Research Paper) (Spring—day)

Master of Laws candidates in the area of International and Comparative Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

302 *Admiralty*
303 *International Law and World Order*
304 *United Nations Law and World Order*
307 *Comparative Law*
309 *Conflicts of Laws*

Other Related Courses

427 *Legal Aspects of International Business Transactions*
440 *Comparative Labor Law*
518 *Use and Control of Nuclear Energy*
562 *Income Taxation of Foreign Business and Investment*
586 *Immigration Law*

TAXATION

Faculty Advisers: D.B. Weaver, L.D. Solomon, D.I. Kempler, T.S. Sims

551 **Taxation—Partnerships and Subchapter S** (2) **Weaver, Sanders, Kempler**

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Practice-oriented study of partnerships, including syndication, organization, and structure of entity, with emphasis on policy examination of areas of IRS principal concern, including tax shelters, disproportionate tax allocations, retroactive allocations, guaranteed payments to partners, contributions of capital, basis for gain or loss, non-recourse financing, "at-risk" rules, current and liquidating distributions, sale of partnership interests, collapsible partnerships, "like-kind" exchanges, termination, special basis adjustments, and distributions to retiring or deceased partners. Planning-oriented analysis of Subchapter S, including procedures for electing and terminating Subchapter S status, treatment of income and losses,

limitations on deductibility of losses, and how to avoid pitfalls. (Examination) (Spring—day and evening)

552 **Criminal Tax Prosecutions** (2)
Criminal tax statutes; elements of tax crimes; methods of proof; Internal Revenue summonses, privileged material. Department of Justice and Internal Revenue policy considerations; searches and seizures, grand jury proceedings, trial problems. (Examination)

553 **Seminar: Estate Planning** (2 or 3) Weaver, McCoy, Solomon
Study of the effective disposition of wealth by inter vivos gift and testamentary transfer, emphasis on income, estate, and gift tax considerations, use of the trust form in the transfer of wealth; use of insurance and jointly held property as part of the estate plan, planning for the continuation or disposition of the client's business interests. Preparation of an estate plan with supporting documents is the major project for the course. Prerequisite: Law 325, 326, 336, and 338. Enrollment limited by the instructors. Solomon, Weaver—(Problem Assignments), McCoy—(Choice of Problem Assignments or Research Paper). (Fall—evening)

555 **Taxation—Special Corporation Problems** (2) Davis
Detailed study of the principal federal tax benefits of the corporate form of doing business. Consideration of problems involved in the tax planning of the corporate structure and corporate operation, including the tax definition of a corporation, the special deductions available to corporate payers, the compensation of the corporate executive and employee, the debt–equity question, the accumulated earnings tax, the personal holding company tax, multiple corporations, and consolidated returns. Survey of the types of corporations receiving special treatment under the Internal Revenue Code, such as financial institutions, real estate investment trusts, regulated investment companies, cooperatives, and small business corporations. Prerequisite: Law 340. (Research Paper or Examination) (Spring—evening)

557 **Taxation—Exempt Organizations** (2) Hopkins
Tax-exempt organizations: policy and practice of preferred tax treatment for selected organizations and gifts to them. Statutes, regulations, and IRS practice; legislative origins, judicial interpretations, and policy considerations. Tests of qualification, disqualification, and limited tax preference. Mechanics of securing and retaining exemption; qualified exemption, unrelated business income, private inurement, political activity. Denial or loss of exemption. Return and reporting requirements. Comparative tax treatment of nonexempt and nonprofit organizations. Special sanctions with respect to private foundations, managers, and donors for improper, excessive, or prohibited activities. Enrollment may be limited. Prerequisite: Law 336. (Choice of Research Paper or Examination) (Fall—evening)

558 **Taxation—Real Estate and Income** (2) Tucker
The effect of income taxes on the real estate market and real estate transactions; sales and exchange of real estate interests, various entities for the ownership and development of real estate, the impact of taxes on the landlord and tenant, the impact of taxes on the mortgagor and mortgagee, including the choice of financing techniques, such as sale-leaseback, depreciation, amortization and obsolescence, basis and basis adjustments, and casualties and other involuntary conversions. Prerequisite: Law 336. Law 340 is suggested but not required. (Examination) (Spring—evening)

559 **Taxation—Oil and Gas** (2) Schuldinger
Application of federal income tax law to producing segment of oil and gas industry. Classification of interests, treatment of exploration and development expenditures. Depletion allowance and concept of economic interests. Sales vs. leasing transactions. Organization problems. Prerequisite: Law 336. (Examination) (Spring—evening)

560 **Taxation—State and Local** (2) Field
Taxation by state and local governments: problems of real and personal

property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems (Choice of Research Paper or Examination) (Fall—evening)

561 **Selected Topics in Taxation—Capital Gains and Losses** (2) Levine
An in-depth study of the federal income tax consequences relating to the sale, exchange, or other disposition of property, including stock and securities, real estate, machinery and equipment, commodities, foreign currency, patents and copyrights, contracts, goodwill and going-concern value, franchises, and other tangible and intangible property. While the primary concern is the distinction between, and effect of, capital and ordinary gain or loss, related areas will be examined, including the alternative minimum tax, disallowance of losses, depreciation recapture, and methods of deferring recognition of gain and loss. Prerequisite: Law 336. (Examination) (Fall—evening)

562 **Income Taxation of Foreign Business and Investment** (2)
The provisions and policies of federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. (Examination)

564 **Seminar: Special Problems of Tax Policy** (2) Sims
Intensive study of selected aspects of the tax structure with primary attention given to the federal income tax. Problem areas are reviewed primarily from the standpoint of tax policy, including legal, economic, social, and practical considerations. Alternative solutions, including current legislative proposals, are examined. Prerequisite: Law 336, 340. (Research Paper)

565 **Taxation—Deferred Compensation I** (2) Chabot, Posner, I. Cohen
Tax and labor law consequences of deferred compensation. Examination of new standards imposed by the Employee Retirement Security Act of 1974. Consideration of tax consequences of "unqualified" plans, lump sum distributions, individual retirement accounts, and the requirement that defined benefit plans be insured by the Pension Benefit Guaranty Corporation. Prerequisite: Law 336. (Problem Assignments and Examination) (Fall—evening)

566 **Taxation—Deferred Compensation II** (2) Chabot, Klevan, I. Cohen
Nonqualified arrangements: constructive receipt, cash equivalent, I.R.C. §§ 83 and 404, and individual retirement accounts. Qualified plans: deductions, distributions (annuities, lump-sum distributions, rollovers, employer stock), ESOPs, termination insurance, fiduciaries and service providers (reporting, disclosure, fiduciary standards, self-dealing), estate and gift tax, unrelated business income, simplified pension plans, and master and prototype plans. Law 336 recommended but not required prior to taking this course. Neither a tax background nor Law 565 is prerequisite. (Examination) (Spring—evening)

567 **Seminar: Tax Practice and Procedure** (2) Smiley, Lauber
Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax practice. Preparation of various documents is required. Prerequisite: 5 semester hours of taxation courses, including Law 336. (Problem Assignments) (Fall—evening)

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

336 *Taxation—Federal Income*
338 *Taxation—Federal Estate and Gift*
340 *Taxation—Federal Income, Corporations and Shareholders*
351 *Law and Accounting*

Other Related Courses

404 *Securities Regulation*
424 *Business Planning*
427 *Legal Aspects of International Business Transactions*

OTHER ADVANCED COURSES

579 Clinical Studies in Urban Law (arr.) Sirulnik and Sta

(1) *Civil Litigation Clinic*—Open to third-year students. Students represe indigent litigants in the Small Claims, Family, Landlord–Tenant and Cr Divisions of the D.C. Superior Court. Work responsibilities include clie interviewing, investigation, settlement negotiations, preparation and argume of motions, as well as conducting actual trials. Two-hour weekly seminar.

(2) *Criminal Appellate Clinic*—Open to third-year students. Students parti pate in preparing actual criminal cases on appeal, starting with review of th transcript and culminating with preparation of brief and oral argument befo U.S. Court of Appeals for the District of Columbia Circuit. Appellate practice an procedure studied through texts; consultation with appellate judges, law clerk and attorneys with cases pending on appeal; observation of arguments in th Supreme Court and the Court of Appeals. Two-hour weekly seminar.

For both sections, admission is by permission of instructor; students mu submit applications during spring term of preceding year. Must be taken for credit hours per term for the entire academic year or for 2 credit hours carrie over both summer sessions. (Fall, spring, summer)

585 Computers and the Law (3) Chandle

A critical study of selected major legal problems presented by computer technology, including the impact upon legal doctrine and legal institution Jurimetrics, the theory of various uses that are and may be made of computer in legal research, the practice of law, and court administration will b examined. Familiarity with the rudiments of computer science or programmin would be helpful, but is not required. (Examination)

586 Immigration Law (2) Stern-Bosto

Law and practice under the McCarran–Walter Act, involving questions o immigration, emigration, expatriation, nationality and naturalization. Consid Immigration and Naturalization Service, and Labor Department practice. (Ex mination) (Fall—evening)

587 Individual Rights and Liberties (3) Dienes, Harr

Principles of equality and due process in the Fifth and Fourteenth Amen ments. The power of Congress to enforce the Fourteenth Amendment. Focus individual rights and liberties under the U.S. Constitution. First Amendme rights, particularly religion and speech clauses. The right of association, othe personal rights in the Bill of Rights. Methodology of judges in deciding cas involving individual rights and liberties, particularly the "balancing test" a the judges' views of societal interests. Prerequisite: Law 212. (Research Pape (Fall—day)

589 Seminar: Law of Privacy (2) Pa

A review of the law of privacy as it has developed in constitutional litigation, law, and state and federal statutes. Current developments and rationales; further expansions of privacy rights are considered. (Research Paper) Woodman, Sm

591 Legislative Drafting (2)

Advanced instruction and practice in legislative drafting, overview of legisla process with emphasis on legislative drafting. Enrollment limited to 30 st dents. (Problem Assignments) (Fall and spring—evening) Cheh, Die

592 Seminar: Constitutional Law (2)

Group study of contemporary problems in constitutional law: powers, constitutional litigation; problems of effectuating constitutional guarantee Limited enrollment. (Research Paper) (Spring—day)

593 **Seminar: American Legal History (2)** **Lowther**
From the outbreak of the Revolution at Lexington and Concord to the death of John Marshall. An examination of men, events, and movements significant in the unfolding of our laws and legal institutions in this formative period of our national life, including a critical examination of the place of the lawyer in a revolutionary age. Comparison of the role of the lawyer during the politically and socially unsettled time of Marshall with the role of the lawyer in today's troubled scene. Members of the seminar present the results of their research and thought by either oral or written reports. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Problem Assignments) (Fall—day)

594 **Professional Responsibility (2)** **Sharpe, Zenoff, Cibinic**
Ethical problems in civil and criminal litigation. Loyalty to the client. Financing of legal services. Etiquette of acquiring and retaining clients. Procedures and problems in legal discipline. Special responsibilities of the government lawyer. Ethical conduct of judges. Issues in *pro bono publico* practice. Ethical responsibilities of law professors. Plea bargaining. Role of the American Bar Association. (Examination) (Spring—evening)

596 **Graduate Clinical Studies (1, 2, 3, or 4)** **Staff**
Limited to LL.M. candidates. Practical experience in the student's area of specialization or interest. The student may work with a government agency, Congressional committee, court, or other such entity performing tasks normally assigned to an attorney. Course approval must be obtained from the student's faculty adviser and/or the Dean. A maximum of four credit hours may be applied toward graduation. For each credit hour, 56 hours of nonremunerated work must be performed. A written report describing in some detail the specific work performed and evaluating the experience received is required. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer)

597 **Independent Studies (arr.)** **Staff**
Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fall and spring)

598 **Research in Public Law (1 or 2)** **Staff**
Limited to graduate students with at least a *B* average who have had a seminar or comparable course in the field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall, spring, summer)

599–600 **Thesis (2–2)**
Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer)

620–21 **Legal Research and Writing (1–1)** **Simon**
(For Foreign Students)
Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)

SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

ENVIRONMENTAL LAW PROGRAM

Director A.W. Reitze, Jr.

The Environmental Law Program consists of course work, individual research and clinical work, with the student selecting the mix that meets his or her particular need. Most courses are offered in the early evening so that they can be taken by students in both the day and evening divisions. Advanced courses are taught by some of the most experienced practitioners in the field.

The clinical program allows students to work for the government or for environmental lawyers in the private sector. Placements are usually available with the Departments of Justice, Energy, and Transportation, the Environmental Protection Agency, and private organizations such as the Environmental Defense Fund, the Natural Resources Defense Council, and the National Wildlife Association. The clinical program offers the student with very specific environmental interests a chance to develop these interests in a work setting. Thus, students with interests in topics such as wetland acquisition, historical protection, or wildlife protection can take relevant course work and then further specialize through the clinical program. If the student is interested in individual research course credit is also available for this type of study.

GOVERNMENT CONTRACTS PROGRAM

Director R.C. Nash, Jr.

A comprehensive government contracts program provides continuing instruction for industry and government personnel in this field and a program of courses leading to the Master of Laws degree in Government Procurement Law. The program includes (1) short seminars, (2) one-week courses in advanced problems in the field, (3) an annual institute treating a problem of contemporary importance, (4) an annual conference in a major area, (5) compilation of materials for use in current courses, (6) publication of a series of monographs treating special problems in the field, and (7) special research projects.

INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Director W.T. Mallison

The objectives of the International and Comparative Law Program are to provide insights, skills, and substantive understanding of international law and foreign legal systems. Specific objectives in international law are to provide an understanding of decision making, sanction processes, legal institutions, and the relationships between domestic and international law. Specific objectives in comparative law include understanding of the basic institutions of civil law countries, the reception of civil law and common law in non-Western countries, and the role of decisional law and judicial review in selected legal systems. Improvements that are needed to promote the rule of law in the world

community are also considered. International aspects of business transactions and economic development are included in the program. The specializations in public law include the humanitarian law that seeks to protect war victims in conflict situations and disaster victims in peace time and promotion of the control of violence when it cannot be eliminated. The objectives of the program are implemented through course work and seminars for both J.D. and post-J.D. degree students and through research and writing in pertinent fields.

LAND USE MANAGEMENT AND CONTROL PROGRAM

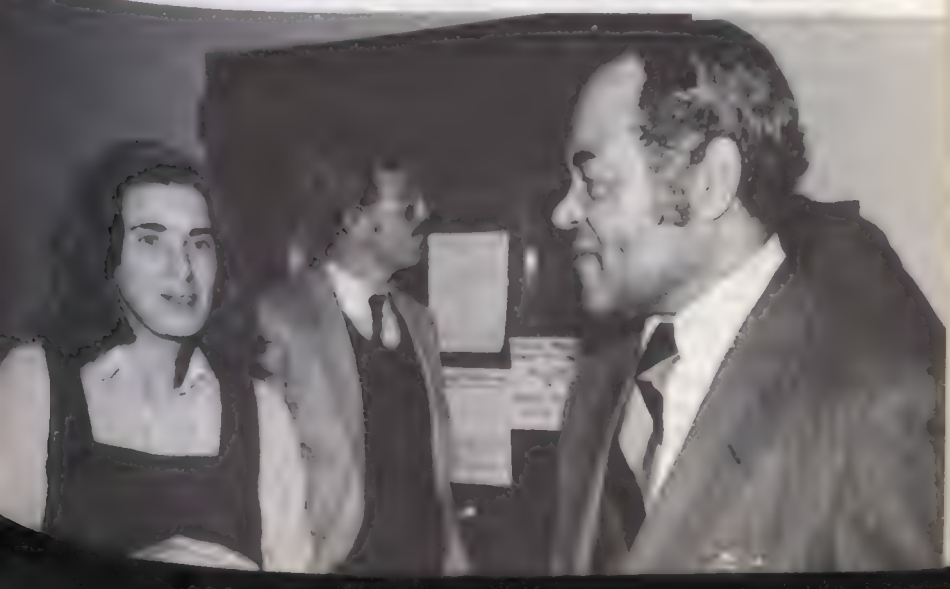
Director J.M. Brown

The social, economic, technological, political, and legal interrelationships generated by the fact that land is a basic, limited-supply natural resource, capable of being subjected to differing but concurrent public and private uses, raise a growing number of issues involving management policy and control measures that are of critical concern to the future of the nation. The Land Use Management and Control Program, through a combination of academic, clinical, and game-simulation processes, seeks to provide an understanding of existing and pending problems, needs, means, and opportunities for solution with respect to this developing area of national concern.

PATENT LAW PROGRAM

Director I. Kayton

The Patent Law Program is designed for students in the J.D. and post-J.D. degree program whose intentions are to specialize in the practice of patent law. An organized program has been developed to offer as complete and as integrated a collection of courses in patent law as possible. The course offerings in patent law now total 17 semester hours, far more than any other law school in the United States. In addition, courses in trademark and copyright law are also available (see the Patent and Trade Regulation Law area of specialization in the Advanced Courses section of this bulletin). The object of the Patent Law Program is to provide the student with a concentration in patent law at a level of specialization and maturity that will enable advancement more rapidly in this field.



GENERAL ALUMNI ASSOCIATION

President Nancy Broyhill Dudley, B.A. in Govt. 1965

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University or of the Board of Trustees of the University.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

THE GEORGE WASHINGTON LAW ASSOCIATION

Director of Law Alumni Relations Clifford A. Dougherty, J.D./W.H.: 1964

The George Washington Law Association was founded in 1912 and has been affiliated with the General Alumni Association since 1926. Its purposes as stated in the constitution are to promote high standards of legal education, to keep the alumni of the school in close touch with one another, especially with members of their own classes, to gather and publish at intervals information as to the whereabouts and activities of these alumni, and to further the interests of the school.

Eligible members are those who have matriculated in the school or National University and have left in good standing, and any member or former member of the faculty of the school. Active members are those eligible members who are current contributors to the Law Annual Support Program of the University and life members of the George Washington Law Association.

The Association plans publication periodically of the Law Alumni Directory. Law alumni are urged to keep the Alumni Office informed of their whereabouts so that directory information can be kept up to date.

The Law Alumni Office is in the University's Gelman Library, 2130 H Street N.W., Washington, D.C. 20052.

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THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees, nor shall any person either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as Foggy Bottom, between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area contains several reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, Public and International Affairs; the Division of Continuing Education and Summer Sessions; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an ex officio member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the International Communication Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the Kennedy Center for the Performing Arts.

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Louis James Harris, *Professor Emeritus of Law*
B.A. 1943, Cornell University; LL.B. 1939, S.J.D. 1942, Brooklyn Law School; LL.M. 1948, George Washington University

W. Wallace Kirkpatrick, *Professor Emeritus of Law*
B.A. 1934, LL.B. 1938, Harvard University

Robert Kramer, *Professor Emeritus of Law; Dean Emeritus of the National Law Center*
B.A. 1935, LL.B. 1938, Harvard University

Arthur Selwyn Miller, *Professor Emeritus of Law*
B.A. 1938, Willamette University; LL.B. 1949, Stanford University; J.S.D. 1959, Yale University

Charles Bernard Nutting, *Professor Emeritus of Law*
B.A. 1927, J.D. 1930, University of Iowa; LL.M. 1932, S.J.D. 1933, Harvard University; LL.D. 1957, University of Pittsburgh; Litt.D. 1957, Geneva College; L.H.D. 1957, Seton Hill College; LL.D. 1960, Dickinson School of Law

ACTIVE

Oscar Altshuler, *Professorial Lecturer in Law*
LL.B. 1951, George Washington University

Peter Aron, *Instructor in Clinical Law*
B.A. 1967, Oberlin College; J.D. 1972, Harvard University

John Banzhaf III, *Professor of Law*
B.S. in E.E. 1962, Massachusetts Institute of Technology; J.D. 1965, Columbia University

The Honorable Iralene Barnes, *Professorial Lecturer in Law*
B.A. 1969, Howard University; J.D. 1972, University of Michigan

Jerome Aure Barron, *Professor of Law; Dean of the National Law Center*
B.A. 1955, Tufts University; LL.B. 1958, Yale University; LL.M. 1960, George Washington University

Robert Howard Becker, *Professorial Lecturer in Law*
B.S.S. 1951, City University of New York, City College; J.D. 1954, Yale University

Stuart Edward Benson, *Professorial Lecturer in Law*
B.A. 1966, J.D. 1972, University of California, Berkeley

Alan Berkeley, *Professorial Lecturer in Law*
B.S. 1964, Cornell University; J.D. 1967, Georgetown University

Stephen Franklin Black, *Professorial Lecturer in Law*
B.A. 1965, Harvard University; J.D. 1968, University of Michigan; B.Litt. 1970, Oxford University

John Bodner, Jr., *Professorial Lecturer in Law*
J.D. 1953, Northwestern University; M.L.A. 1969, Johns Hopkins University

Joseph L. Brand, *Professorial Lecturer in Law*
B.A. 1958, University of Michigan; M.A. 1959, Ohio State University; J.D. 1963, George Washington University

James Milton Brown, *Professor of Law; Director of the Land Use Management and Control Program*
B.A. 1943, University of Illinois; J.D. 1963, University of Florida

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B.S. 1960, Iowa State University of Science and Technology; J.D. 1967, George Washington University

David Turkle Buente, Jr., *Associate Professorial Lecturer in Law*
B.S. 1968, Lehigh University; J.D. 1975, University of Pennsylvania

*Gerald Martin Caplan, *Professor of Law*
B.A. 1959, M.A. 1960, J.D. 1963, Northwestern University

Richard D. Carter, *Adjunct Instructor in Law*
B.A. 1977, Pace University; J.D. 1980, George Washington University

The Honorable Herbert Chabot, *Professorial Lecturer in Law*
B.A. 1952, City University of New York, City College; LL.B. 1957, Columbia University; LL.M. 1964, Georgetown University; Judge, United States Tax Court

†James Phillip Chandler, *Professor of Law*
B.A. 1963, University of California, Berkeley; J.D. 1970, University of California, Davis; LL.M. 1971, Harvard University

†Mary M. Cheh, *Associate Professor of Law*
B.A. 1972, Rutgers—The State University (Douglass College); J.D. 1975, Rutgers—The State University; LL.M. 1977, Harvard University

John Cibinic, Jr., *Professor of Law*
B.A. 1956, University of Pittsburgh; J.D. 1960, George Washington University

Evelyn Levine Coburn, *Adjunct Instructor in Law*
B.A. 1966, City University of New York, Hunter College; M.A. 1967, Northwestern University; J.D. 1974, Catholic University of America

Ira Cohen, *Professorial Lecturer in Law*
B.S. 1963, City University of New York, City College

Thomas Francis Courtless, Jr., *Professor of Law and of Sociology; Director of the Institute of Law, Psychiatry, and Criminology*
B.A. 1955, Pennsylvania State University; M.A. 1960, Ph.D. 1966, University of Maryland

Clair Allan Cripe, *Professorial Lecturer in Law*
B.A. 1954, Oberlin College; LL.B. 1957, Harvard University

Warren Davis, *Associate Professorial Lecturer in Law*
B.S.F.S. 1969, J.D. 1974, Georgetown University

Stephen J. Del Giudice, *Instructor in Clinical Law*
B.A. 1974, University of Rhode Island; M.A. 1976, University of Toledo; J.D. 1979, Antioch School of Law

Paul Gerald Dembling, *Professorial Lecturer in Law*
B.A. 1940, M.A. 1942, Rutgers—The State University; J.D. 1951, George Washington University

Charles Thomas Dienes, *Professor of Law*
B.S. 1961, Loyola University of Chicago; J.D. 1964, Ph.D. 1968, Northwestern University

Fred Russell Disheroon, *Professorial Lecturer in Law*
B.A. 1953, Hendrix College; J.D. 1956, Southern Methodist University; LL.M. 1974, George Washington University

James H. Doyle, Jr., *Professorial Lecturer in Law*
B.S. 1946, U.S. Naval Academy; J.D. 1953, George Washington University

George Bennett Driesen, *Professorial Lecturer in Law*
B.A. 1954, Harvard University; LL.B. 1961, Yale University

William H. DuRoss III, *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1968, LL.M. 1971, George Washington University

Thomas Francis Field, *Professorial Lecturer in Law*
B.A. 1954, University of Notre Dame; M.A. 1958, Oxford University; J.D. 1961, Harvard University; LL.M. 1968, Georgetown University

Carl Martin Fink, *Instructor in Clinical Law*
B.A. 1975, University of Pittsburgh; M.B.A. 1978; J.D. 1979, George Washington University

Salvatore Francis Fiscina, *Professorial Lecturer in Law*
B.A. 1963, Harvard University; M.D. 1967, University of Rochester; J.D. 1973, George Washington University

Gerald I. Fisher, *Adjunct Instructor in Law*
B.A. 1972, College of William and Mary; J.D. 1978, Catholic University of America

Mary-Christy Fisher, *Instructor in Clinical Law*
B.A. 1974, Manhattanville College; J.D. 1979, George Washington University

Michael Richard Flyer, *Professorial Lecturer in Law*
B.A. 1959, LL.B. 1962, University of Michigan

---

*On sabbatical leave spring semester 1984
†On leave of absence academic year 1983–84

Richard Louis Fruchterman, Jr., *Professorial Lecturer in Law*
B.S. 1951, J.D. 1954, Georgetown University

Gilbert Jerome Ginsburg, *Professorial Lecturer in Law*
B.A. 1954, B.A. in Law 1955, J.D. 1957, University of Chicago

Harold Paul Green, *Professor of Law*
B.A. 1942, J.D. 1948, University of Chicago

Michael H. Hammer, *Associate Professorial Lecturer in Law*
B.A. 1976, Rutgers—The State University; J.D. 1979, George Washington University

The Honorable Patricia Roberts Harris, *Professor of Law*
B.A. 1945, Howard University; J.D. 1960, George Washington University

Ann Marie Hay, *Adjunct Instructor in Law*
B.A. 1963, University of California, Berkeley; B.S. 1968, University of Minnesota; J.D. 1978, Georgetown University

Anita Kessler Head, *Professor of Law; Librarian of the Law Library*
Lic.iur. 1955, University of Berne; M.S. in L.S. 1969, Columbia University

William Norman Hedeman, Jr., *Professorial Lecturer in Law*
B.A. 1964, Gettysburg College; J.D. 1968, University of Maryland; LL.M. 1972, George Washington University

Laurence Roy Hefter, *Professorial Lecturer in Law*
B.M.E. 1957, M.S.M.E. 1960, Rensselaer Polytechnic Institute; J.D. 1964, George Washington University

Michael Arnold Hertzberg, *Professorial Lecturer in Law*
B.A. 1966, Colgate University; J.D. 1969, George Washington University

Harold Lester Hirsh, *Professorial Lecturer in Law*
M.D. 1942, Georgetown University; J.D. 1972, American University

Sheila Slocum Hollis, *Professorial Lecturer in Law*
B.S. 1971, University of Colorado; J.D. 1973, University of Denver

Bruce Richard Hopkins, *Professorial Lecturer in Law*
B.A. 1964, University of Michigan; J.D. 1967, LL.M. 1971, George Washington University

Linda R. Horton, *Professorial Lecturer in Law*
B.A. 1968, University of Kentucky; J.D. 1975, George Washington University

S. Neil Hosenball, *Professorial Lecturer in Law*
B.S. 1948, University of Michigan; LL.B. 1951, Harvard University

Tao-tai Hsia, *Professorial Lecturer in Law*
LL.B. 1945, National Cheng-chih University, China; LL.M. 1950, J.S.D. 1952, Yale University

J. Mark Iwry, *Assistant Professorial Lecturer in Law*
B.A. 1972, M.P.P. 1976, J.D. 1976, Harvard University

Radwan Jabri, *Professorial Lecturer in Law*
LL.B. 1965, University of Aleppo; M.C.L. 1968, University of Miami; LL.M. 1970, S.J.D. 1972, George Washington University

Charles Richard Johnston, Jr., *Professorial Lecturer in Law*
B.A. 1970, Ohio Wesleyan University; J.D. 1973, California Western School of Law

Emile Lavon Julian, *Adjunct Instructor in Law*
B.A. 1968, Franklin and Marshall College; J.D. 1971, Howard University

Alan Hirsh Kaplan, *Professorial Lecturer in Law*
B.A. 1951, LL.M. 1957, New York University; LL.B. 1954, Harvard University

Stephen Zeivel Kaufman, *Professorial Lecturer in Law*
B.A. 1966, University of Maryland; J.D. 1969, University of Baltimore

Irving Kayton, *Professor of Law; Director of the Patent Law Program*
B.A. 1951, Cornell University; LL.B. 1957, New York University; LL.M. 1964, J.S.D. 1967, Columbia University

David Israel Kempler, *Associate Professor of Law*
B.S. 1963, University of Pennsylvania; J.D. 1966, University of Connecticut; LL.M. 1967, Georgetown University

John Alexander Kendrick, *Professorial Lecturer in Law*
B.A. 1942, LL.B. 1943, George Washington University

Peter Cornelius Kirby, *Associate Professorial Lecturer in Law*
B.A. 1971, Yale University; J.D. 1975, Harvard University

Morton Klevan, *Professorial Lecturer in Law*
B.A. 1959, Columbia University; LL.B. 1963, Harvard University

Harold Hongju Koh, *Assistant Professorial Lecturer in Law*
B.A. 1975, J.D. 1980, Harvard University; B.A. 1977, Oxford University

Edward Victor Alphonse Kussy, *Associate Professorial Lecturer in Law*
B.A. 1968, J.D. 1971, University of Michigan; LL.M. 1981, George Washington University

Albert George Lauber, Jr., *Associate Professorial Lecturer in Law*
B.A. 1971, J.D. 1977, Yale University. M.A. 1974, Cambridge University.

Henry D. Levine, *Associate Professorial Lecturer in Law*
B.A. 1972, Yale University. J.D. 1976, Harvard University.

Howard Jay Levine, *Associate Professorial Lecturer in Law*
B.A. 1969, City University of New York, Hunter College. J.D. 1972, State University of New York at Buffalo; LL.M. 1976, Georgetown University.

Jack Lewis, *Professorial Lecturer in Law*
B.A. 1965, Brown University; J.D. 1969, Cornell University.

David Crittenden Lowther, *Professor of Law*
B.A. 1948, Harvard University; LL.B. 1951, University of Virginia.

William Thomas Mallison, *Professor of Law; Director of the International and Comparative Law Program*
J.S.D. 1967, Yale University.

Martin Guilbert Malsch, *Professorial Lecturer in Law*
B.S. 1964, College of the Holy Cross; J.D. 1968, University of Connecticut.

The Honorable Howard Thomas Markey, *Professorial Lecturer in Law*
J.D. 1949, Loyola University; LL.M. 1950, John Marshall Law School.

Louis Harkey Mayo, *Professor of Law; Vice President for Policy Studies and Special Projects*
B.S. 1940, U.S. Naval Academy; LL.B. 1949, University of Virginia. J.S.D. 1953, Yale University.

Robert Bruce McCaw, *Professorial Lecturer in Law*
B.S. 1965, Georgetown University. J.D. 1970, University of Virginia.

Jerry J. McCoy, *Professorial Lecturer in Law*
B.S. 1963, West Virginia University. LL.B. 1966, Duke University. LL.M. 1967, New York University.

Kenneth Everett Melson, *Associate Professorial Lecturer in Law*
B.A. 1970, Denison University; J.D. 1973, George Washington University.

Leroy Sorenson Merrifield, *Lobingier Professor of Jurisprudence and Comparative Law*
B.A. 1938, LL.B. 1941, University of Minnesota. M.P.A. 1942, S.J.D. 1956, Harvard University.

Peter H. Meyers, *Associate Professorial Lecturer in Law*
B.A. 1968, Marietta College. J.D. 1971, George Washington University.

Waldo Hawthorne Moore, *Professorial Lecturer in Law*
J.D. 1949, M.P.L. 1953, George Washington University.

Dennis R. Murphy, *Adjunct Instructor in Law*
B.A. 1972, University of Illinois; J.D. 1976, Georgetown University.

*Ralph Clarke Nash, Jr., *Professor of Law; Director of the Government Contracts Program*
B.A. 1953, Princeton University; J.D. 1957, George Washington University.

Stephen Michael Nassau, *Professorial Lecturer in Law*
B.A. 1961, Brown University. J.D. 1964, Columbia University.

Saul Chesterfield Oppenheim, *Distinguished Scholar and Adviser in the National Law Center*
B.A. 1918, M.A. 1920, Columbia University; J.D. 1926, S.J.D. 1929, University of Michigan. LL.D. 1973, George Washington University.

Arnold Ordman, *Professorial Lecturer in Law*
B.A. 1933, Boston University; LL.B. 1936, Harvard University.

Robert Eugene Park, *Professor of Law*
B.S. 1952, B.A. 1957, J.D. 1961, University of Florida. LL.M. 1965, Yale University.

David Andreas Peterson, *Professorial Lecturer in Law*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University.

Ronald L. Plesser, *Professorial Lecturer in Law*
B.A. 1967, J.D. 1970, George Washington University.

Maximilian Pock, *Professor of Law*
J.D. 1958, University of Iowa. S.J.D. 1962, University of Michigan.

Nancy D. Polikoff, *Assistant Professorial Lecturer in Law*
B.A. 1972, University of Pennsylvania. J.D. 1975, Georgetown University. M.A. 1980, George Washington University.

William Posner, *Associate Professorial Lecturer in Law*
B.S. 1961, University of Maryland. J.D. 1967, American University.

*On sabbatical leave fall semester 1983

Edward Andrew Potts, *Professor of Law; Associate Dean of the National Law Center*
B.A. 1949, University of Michigan; LL.B. 1952, George Washington University

Theodore L. Press, *Associate Professorial Lecturer in Law*
B.A. 1965, Cornell University; J.D. 1968, Columbia University

The Honorable William C. Pryor, *Professorial Lecturer in Law*
B.A. 1954, Dartmouth College; LL.B. 1959, Georgetown University; Judge, District of Columbia Court of Appeals

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

Peter Raven-Hansen, *Associate Professor of Law*
B.A. 1968, J.D. 1974, Harvard University

Arnold Winfred Reitze, Jr., *Professor of Law; Director of the Environmental Law Program*
B.A. 1960, Fairleigh Dickinson University; J.D. 1962, Rutgers—The State University

David Robinson, Jr., *Professor of Law*
B.A. 1950, Reed College; J.D. 1956, Columbia University; LL.M. 1965, Harvard University

Donald Phillip Rothschild, *Professor of Law*
B.A. 1950, University of Michigan; J.D. 1965, University of Toledo; LL.M. 1968, Harvard University

The Honorable Joseph Michael Francis Ryan, Jr., *Professorial Lecturer in Law*
B.A. 1943, St. Joseph's College, Pennsylvania; LL.B. 1950, LL.M. 1952, Georgetown University; Judge, Superior Court of the District of Columbia

Michael Sanders, *Professorial Lecturer in Law*
B.S. 1960, LL.B. 1964, New York University; LL.M. 1967, Georgetown University

Donald W. Savelson, *Professorial Lecturer in Law*
B.S. 1963, Cornell University; LL.B. 1967, Fordham University

Peter Carey Schaumber, *Professorial Lecturer in Law*
B.S.B.A., J.D. 1968, Georgetown University

Roger Edward Schechter, *Associate Professor of Law*
B.A. 1973, George Washington University; J.D. 1976, Harvard University

Lewis Aaron Schiller, *Professor of Law*
B.A. 1950, LL.B. 1952, University of Texas; M.A. 1958, Tufts University

Moshe Schuldinger, *Professorial Lecturer in Law*
B.A. 1953, City University of New York, Brooklyn College; LL.B. 1956, New York University

Richard Lewis Schwaab, *Associate Professorial Lecturer in Law*
B.S. 1967, University of Wisconsin; J.D. 1971, George Washington University

Teresa Moran Schwartz, *Professor of Law; Director of the Enrichment Program*
B.A. 1965, Stanford University; J.D. 1971, George Washington University

Lester Barry Seidel, *Professorial Lecturer in Law*
B.A. 1966, University of Michigan; J.D. 1969, George Washington University; LL.M. 1970, University of Missouri—Columbia

David Earl Seidelson, *Professor of Law; Director of the Teaching Fellow Program*
B.A. 1951, LL.B. 1956, University of Pittsburgh

Joel Seligman, *Visiting Professor of Law*
B.A. 1971, University of California, Los Angeles; J.D. 1974, Harvard University

David James Sharpe, *Professor of Law*
B.A. 1950, University of North Carolina; LL.B. 1955, S.J.D. 1969, Harvard University

Benjamin M. Shieber, *Visiting Professor of Law*
B.S. 1952, LL.B. 1953, Columbia University

Jay A. Shulman, *Visiting Associate Professor of Law*
B.A. 1973, Cornell University; J.D. 1977, Northwestern University

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B.A. 1972, Brandeis University; J.D. 1975, Harvard University

Theodore Stuart Sims, *Associate Professor of Law*
B.A. 1967, Columbia University; J.D. 1970, University of Chicago

George M. Sirilla, *Professorial Lecturer in Law*
B.M.E. 1952, Rensselaer Polytechnic Institute; J.D. 1956, Georgetown University

Eric Scott Sirulnik, *Professor of Law; Director of Clinical Programs*
B.A. 1965, Franklin and Marshall College; J.D. 1968, Boston University; LL.M. 1970, George Washington University

Stafford Smiley, *Associate Professorial Lecturer in Law*
B.A. 1970, Yale University; J.D. 1976, Harvard University

Paul Smith, *Associate Professorial Lecturer in Law*
B.A. 1966, California State University, Long Beach; J.D. 1972, University of Southern California

Lewis David Solomon, *Professor of Law*
B.A. 1963, Cornell University; J.D. 1966, Yale University

James Edward Starrs, *Professor of Law and of Forensic Sciences*
B.A., LL.B. 1958, St. John's University, New York; LL.M. 1959, New York University

Charles J. Steele, *Professorial Lecturer in Law*
B.A. 1952, J.D. 1954, LL.M. 1957, Georgetown University

Jacob A. Stein, *Professorial Lecturer in Law*
LL.B. 1948, George Washington University

Richard Alan Stern-Boswell, *Assistant Professor of Clinical Law; Director of Trial Practice Court*
B.A. 1975, Loyola University of Los Angeles; J.D. 1979, George Washington University

Bradley Specht Stetler, *Adjunct Instructor in Law*
B.A. 1975, Bucknell University; J.D. 1978, George Washington University

Alexander Louis Stevas, *Professorial Lecturer in Law*
B.A. 1949, LL.B. 1951, George Washington University

Joan H. Strand, *Instructor in Clinical Law*
B.A. 1972, J.D. 1975, George Washington University

Jerome Kenneth Tankel, *Professorial Lecturer in Law*
B.A. 1957, University of Illinois; J.D. 1963, Harvard University; LL.M. 1968, George Washington University

Morton S. Taubman, *Professorial Lecturer in Law*
B.S. 1965, J.D. 1969, University of Baltimore

Ralph C. Thomas III, *Instructor in Clinical Law*
B.A. 1975, University of California, Berkeley; J.D. 1978, Harvard University

Eugene Tillman, *Associate Professorial Lecturer in Law*
B.A. 1973, J.D. 1976, University of California, Los Angeles

Robert Max Tobias, *Professorial Lecturer in Law*
B.A. 1965, M.B.A. 1967, University of Michigan; J.D. 1969, George Washington University

Roger Hans Trangsrud, *Associate Professor of Law*
B.A. 1972, Carleton College; J.D. 1975, University of Chicago

Stefan Franklin Tucker, *Professorial Lecturer in Law*
B.B.A. 1960, J.D. 1963, University of Michigan

Geoffrey Judd Vitt, *Associate Professorial Lecturer in Law*
B.A. 1969, J.D. 1972, George Washington University

David Benson Weaver, *Professor of Law*
B.A. 1943, Ohio Wesleyan University; J.D. 1948, Case Western Reserve University

Glen Earl Weston, *Oppenheim Professor of Antitrust and Trade Regulation Law*
B.S. 1943, University of Maryland; J.D. 1948, George Washington University

John Leslie White, *Professorial Lecturer in Law*
B.A. 1948, M.S. 1949, Kalamazoo College; J.D. 1958, George Washington University

Guy Kent Woodman, *Associate Professorial Lecturer in Law*
B.A. 1971, Oklahoma State University; J.D. 1974, Vanderbilt University

Elyce Zenoff, *Professor of Law*
B.S. 1951, University of Wisconsin; LL.B. 1954, Northwestern University

Luize Elizabeth Zubrow, *Associate Professor of Law*
B.A. 1969, J.D. 1972, University of Colorado

TEACHING FELLOWS 1983-1984

Mary Beth Beattie, *Teaching Fellow in Law*
B.A. 1978, Valparaiso University; J.D. 1983, George Washington University

Sharon Faye Carton, *Teaching Fellow in Law*
B.A. 1976, Long Island University, C.W. Post College; J.D. 1979, Hofstra University

Kathleen D. Crane, *Teaching Fellow in Law*
B.A. 1975, Boston College; J.D. 1980, Emory University

Ann J. Davidson, *Teaching Fellow in Law*
B.A. 1969, University of Michigan; Ed.M. 1974, Boston University; J.D. 1980, Northeastern University

Emmette Franklin Hale III, *Teaching Fellow in Law*
B.S. 1973, J.D. 1981, University of Mississippi

John Philip Kernodle, *Teaching Fellow in Law*
B.S. 1976, University of Tennessee at Martin; J.D. 1979, Memphis State University

Todd Francis Simon, *Teaching Fellow in Law*
B.S. 1974, University of Nebraska at Omaha; J.D. 1980, Boston College

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	1st year	*2nd year*	*3rd year*	*4th year*	*Graduate*	*Other*
Day	325	337	344	.....	80	7
Evening	120	96	95	84	161	39

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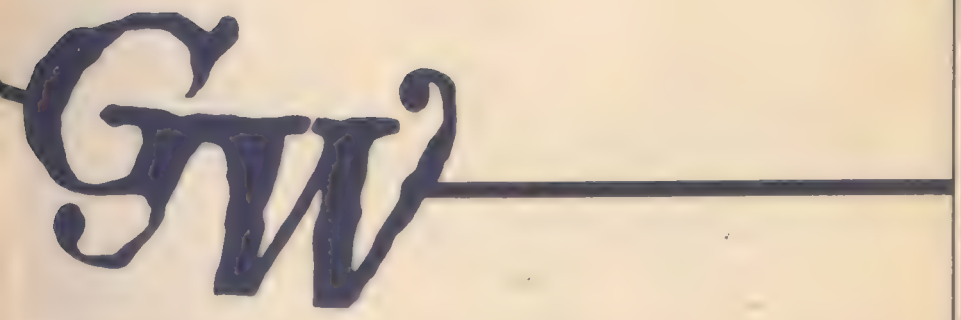
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Volume LXXXII, No. 2, April 1983

SCHOOL OF ENGINEERING AND APPLIED SCIENCE
1983-1984

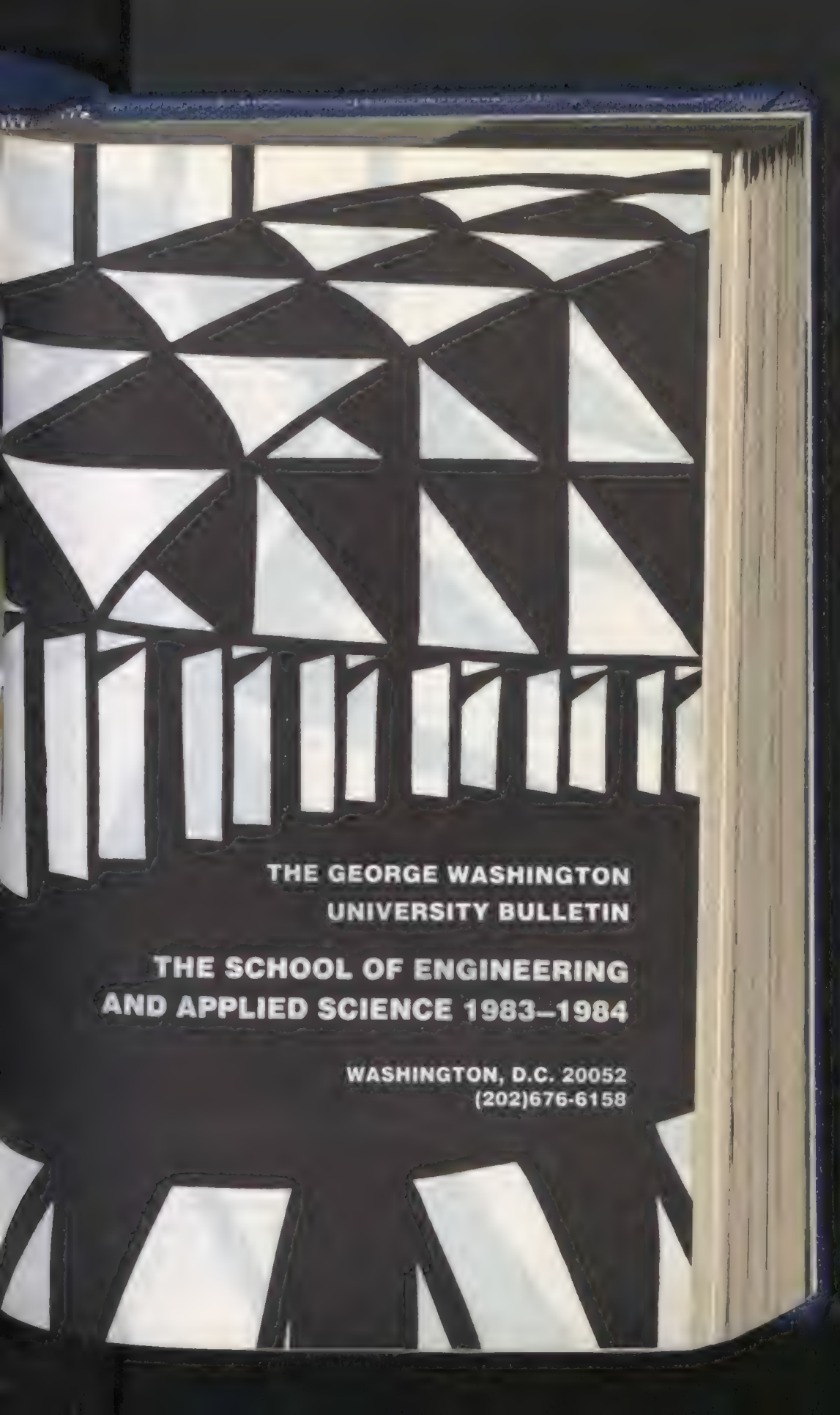
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CENTENNIAL YEAR
October 1, 1884 - October 1, 1984

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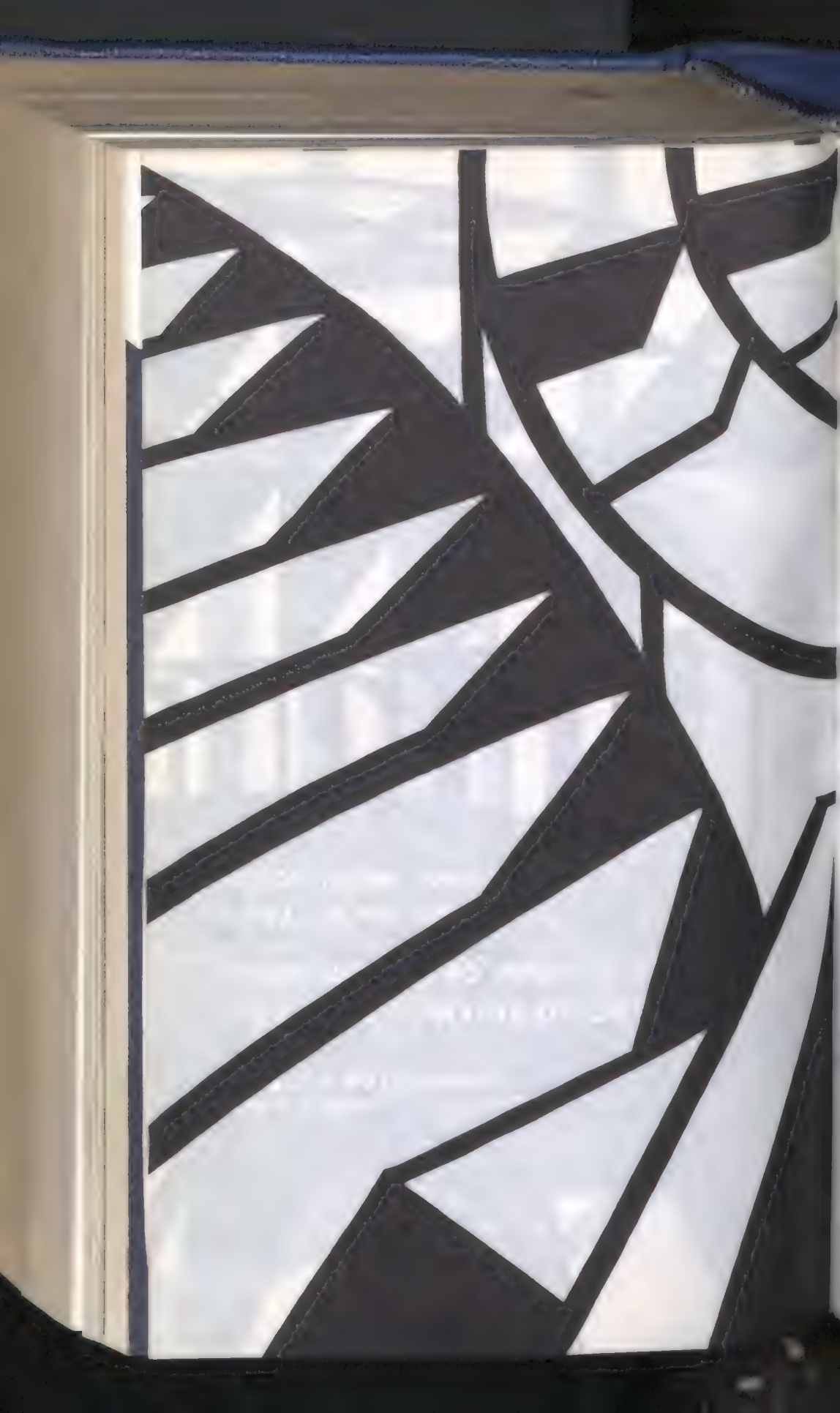




THE GEORGE WASHINGTON
UNIVERSITY BULLETIN

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1983–1984

WASHINGTON, D.C. 20052
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Calendar 1983–1984*

1983 Fall Semester

August 30–31	Advising for all students
August 31	Orientation for new students from foreign countries
September 1	Orientation and placement tests for all new undergraduate students
†*August 31–September 2*	Registration—Tompkins Hall of Engineering Application for February graduation due as part of registration
September 5	Labor Day (holiday)
September 6	Classes begin
November 1	Application for spring semester financial aid due
November 21	D.Sc. dissertations of February candidates due
November 23	Thanksgiving recess begins after last class
November 28	Classes resume
December 6	Last day of fall semester classes
December 12–21	Examination period

1984 Spring Semester

January 6	Master's theses of February candidates due
January 9	Orientation for new students from foreign countries
January 10–11	Orientation and placement tests for all new undergraduate students Advising for all students
†*January 11–13*	Registration—Tompkins Hall of Engineering Application for May graduation due as part of registration
January 16	Spring semester classes begin
February 6	Deadline for submission of 1984–85 freshman student financial aid applications
February 20	Winter Convocation (holiday)
March 1	Deadline for submission of 1984–85 continuing and transfer undergraduate student financial aid applications
March 5	D.Sc. dissertations of May candidates due
March 10	Spring recess begins after last class
March 19	Classes resume
April 1	Deadline for submission of Summer Sessions and 1984–85 graduate financial aid applications
April 16	Master's theses of May candidates due
April 20	Last day of spring semester classes
April 26–May 5	Examination period
May 6	Commencement

*The academic calendar is subject to change

†The registration procedure and hours of registration are stated in the *Schedule of Classes*, which is available well in advance of each semester

1983

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To All Prospective Students:

The School of Engineering and Applied Science has been in continuous session since 1884 and offers programs of study leading to bachelor's, master's, professional, and doctoral degrees. Its prime objective is to develop in the student the precious asset of a well-trained mind that may be applied to the attainment of our many national objectives. In these changing times, it is necessary to search for quality. Students and faculty have the opportunity of assisting in the planning and implementation of educational programs. Periodic examinations are made of the School's objectives and how they relate to those established by the Accreditation Board for Engineering and Technology. Emphasis includes such items as the student's basic and advanced levels of education and his or her role in present and future society.

This catalogue describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Engineering Honors Scholarships, Cooperative Education Program in Engineering, and the Joint Institute for Advancement of Flight Sciences (JIAFS).

The program of Engineering Honors Scholarships has been established to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of academic merit only, and financial need is not a requirement for consideration.

The Cooperative Education Program in Engineering provides the undergraduate engineering student the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings may help pay for part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA–Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA–Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching.

The School of Engineering and Applied Science is a professional school in a university comprised of eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The metropolitan Washington area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students after graduation.

The atmosphere of the School is one of serious-minded effort toward mature development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Many alumni of the School are successfully engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in the engineering profession.

The faculty of the School and I look forward to a closer and more fruitful relationship with you. If you need additional information, please do not hesitate to call upon the department chairmen or me.

Harold Liebowitz
Dean



The Study of Engineering

The Meaning of Engineering and Applied Science

The responsibilities and activities of the engineering profession extend into every aspect of industry and research and into many fields of commerce and the arts. Engineers face problems in the production and distribution of all types of manufactured products, including the design of mechanical, electrical, and chemical processes, of equipment, and of plants in which such products are made; in the design and construction of a variety of structures such as bridges, tunnels, harbors, and dams; in aircraft design and construction, including complicated electronic equipment for control, guidance, and communication; in the operation of transportation systems; in the automotive industry; in the missile and space programs; in energy resources and power and in the generation and transmission of power; in modern communication; in traffic control; in city planning; in public health and sanitation as it affects the environment; and in ventilation and refrigeration. This list of applications is far from exhaustive; it does indicate, however, that engineering is a broad profession in which there are many opportunities to specialize.

The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. The President's Scientific Advisory Committee points out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in his chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to develop and create things for human use. . . . While scientists have uncovered the basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our community living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge as a service to society, financial considerations, human resources, and society's needs are interrelated. The engineer is concerned, therefore, with the means for operating a dynamic society and must consider not only whether the knowledge that exists will enable the creation of a workable product but also how the product can be built, who will use it, and how such use will affect the environment in which it will operate.

The Professional Engineer

Engineers are concerned with the quality and preservation of human life. The term engineer, as used in this Bulletin and as commonly understood in our society, refers to the person who makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of purpose in serving as an intellectual agent in the practical world. This responsibility of the engineer arises from the breadth of the implications of engineering for the whole of society as well as from the depth of the requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that even though the threshold of space has been crossed, the union of medical and engineering practice has been achieved, and breakthroughs have been made in other areas, this impact of engineering on modern life is just a modest preview of the engineering of tomorrow.

Engineering Education and the Student

Rapidly changing and progressing engineering activity requires education for the future based on fundamental principles of science useful in applications to a dynamic, advanced society. In the fields of engineering and applied science, there is no substitute for demonstrated ability and competence to solve the problems faced. Without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze and interpret all aspects of a problem, to formulate solutions, and to evaluate those solutions in light of all available information. To assure that students' undergraduate education will enable them to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates and appraises the undergraduate program.

The curricula of the School of Engineering and Applied Science are founded on the basic principle of assisting the student in preparing for a career in engineering and applied science. This philosophy requires that the student master the principles on which future practice will be based. An education centered on that meaningful junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, science, history, government, and other disciplines, requires scholars. But in any of these areas, the prospective student who has not achieved high scholastic standing can find a place if he or she has genuine interest in the subject. The average student who is interested and willing to

work will find in engineering and applied science a rich and varied field of study that can lead to satisfaction and success. It is difficult to make generalizations in this area, but students who have demonstrated an aptitude for mathematics, science, and English will probably find the work of engineers and the study of engineering and applied science satisfying and challenging. Innate intellectual curiosity and the desire to learn and to work hard are good indicators of success. College Board examinations may reveal the capacity to undertake further study in mathematics and science and their applications to engineering. No school or college can "give" an education. It can offer only the opportunity to "get" an education. The George Washington University's School of Engineering and Applied Science provides an opportunity for close contact with faculty members as well as the opportunity to participate in student organizations and many other student activities. The School recognizes the individual as the most important element in the educational process.



THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

History

The School of Engineering and Applied Science was organized October 1, 1884, as the Corcoran Scientific School of Columbian University and was situated in the University Building then at 15th and H Streets, N.W. The School was named in honor of William W. Corcoran, Trustee and President of the Corporation from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to the creation of the Washington College of Engineering in 1905 as one of the several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to undergraduate degrees in engineering and architecture.

In 1909 the name of the College was changed to the College of Engineering and Mechanic Arts, and the curricula were revised to give the student a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which the student could build and by which he or she might solve new problems as they were met in practice.

The name of the School was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis upon principles rather than technology, which had characterized the School since 1903, was continued and has remained to this day as one of the important distinguishing features of the School.

In 1962 the name of the School became the School of Engineering and Applied Science.

Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The undergraduate curricula in Civil Engineering, Electrical Engineering, and Mechanical Engineering are accredited by the Accreditation Board for Engineering and Technology.

University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

Undergraduate Study

The undergraduate program is intended to provide a solid foundation in the basic principles, concepts, and techniques underlying engineering and applied science, on which the individual may build technical competence in a variety of areas as his or her professional career develops. It is preparation for a career in engineering or applied science as it exists today and as it may develop in the future.

Undergraduate study is the formal beginning of a lifelong continuing program of education. The School provides an environment that fosters the attitudes and disciplines essential to professional growth. Graduates, when they receive the bachelor's degree, are prepared for productive work in the chosen field and for further development and progress, both formal and informal. The undergraduate curricula include courses in the humanities and social sciences to the extent necessary to develop a reasonable understanding and appreciation of these areas of knowledge.

Admission to the engineering program indicates that the student possesses the required preparation and the probable capacity to meet the academic demands of this School. Since the School cannot predict either the student's response to the academic demands or the program to follow for the most effective development, the undergraduate program has been designed to offer a variety of experiences through which the student may find the best path to educational growth and maturity.

The School is a place for learning, for experiencing adventures of the mind and of the hand, and for the formulation, exchange, and exploration of ideas.

During the undergraduate years, the student is led to strengthen skills in analysis and talent for creative activity through liberal use of project-type laboratory work. Independent thought and original ideas receive higher evaluation in the appraisal of student achievements than does rote recital of information.

To provide undergraduate engineering students with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with relevant, real-world employment that provides practical, firsthand experience in engineering, the School of Engineering and Applied Science has an optional Cooperative Education Program in Engineering in which arrangements have been made with leading industrial and governmental organizations for student employment at prevailing salary rates. Every effort is made to place students in positions of employment that provide the best possible engineering experience consistent with career plans. These work periods provide students with income that may be used to finance the major portion of tuition and other expenses. Entering freshmen, as well as transfer students whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

Admission to Undergraduate Study

Admission is the first selective step in a series of qualifying steps the student takes in his or her progress toward professional competence in engineering. It indicates the School's belief that the applicant has at least the minimum preparation and ability to complete the curriculum successfully.

The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

Application for Admission

An applicant for admission obtains from the Office of Admissions of the University or from the School of Engineering and Applied Science an application blank that must be filled out completely and returned with the $20 application fee. Application fee must be by check or postal money order, payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in a degree program at the time of his or her last registration at this University and who has not since registered at another institution.

Incoming Freshmen

Consideration for admission is based on the following: (1) an acceptable certificate of graduation from an accredited high school showing at least 16 units;* (2) scores on the College Entrance Examination Board's Scholastic Aptitude Test (SAT) or on the American College Test (ACT); (3) high school grades; (4) class standing. Although there are no cutoff scores per se, the tests must be taken and are considered in determining admission requirements. Students whose combined SAT scores are below 1,050 (550 mathematics) must

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 60-minute periods of prepared classroom work.

show superior academic work in their high school grades in order to be considered favorably for admission.

The principal's statement that the applicant is prepared to undertake college work may also be requested by the University.

Twelve of the 16 units required for entrance must be distributed as follows: four in English; four in mathematics including two in Algebra, one in plane geometry, one-half in trigonometry, and one-half in precalculus; one in physics; one in chemistry; and two in history or a foreign language. General science may not be counted in satisfaction of the science requirement but may be counted as an elective unit.

The qualifications of applicants who, because of unusual circumstances, do not meet the above requirements will be considered by the School, but additional mathematics or English placement tests may be prescribed.

An applicant must arrange to have sent directly *from his or her school to the Office of Admissions of the University* the secondary school academic record. This information must be stated on a standard form used by the secondary school, and all essential information must be included.

Quantitative Deficiency—A graduate of an approved high school who lacks not more than two units of the required subjects and who presents 16 acceptable units may be admitted to a prescribed program that includes courses to make up the deficiencies.

Applicants who wish to begin study in the fall semester should formulate plans early in the high school senior year. Although the University prefers to have applications submitted during the fall semester of the high school senior year, applications may be submitted until August 1. Students wishing to be considered for financial aid or on-campus housing, however, should have their applications and all required documents submitted by February 1. Students graduating at mid-term who wish to begin study in the spring semester *should* have their applications, transcripts, and other required documents submitted no later than December 15. Applications and all required credentials of students wishing to begin study in either the first or second term of the summer session must be received prior to April 15. Applications for the third summer session should be received by June 15.

Although decisions on some applications for the fall semester will require submission of seventh-term grades and senior-year College Board test scores, an earlier decision may be given after September 1 to a student whose application comes complete with a secondary school record through the junior year and junior-year test scores, provided these records clearly establish academic admissibility.

Transfer Students

Transfer students from other institutions (see page 24 for minimum residence requirement) should submit all applications and required credentials prior to August 1 for the fall semester, December 1 for the spring semester, and April 1 for the summer sessions.

The transfer student must be in good standing in regard to scholarship and conduct and should have a minimum grade-point average of 2.7 on a 4.0 scale. A student who has been suspended more than one time, has been academically dismissed, or is currently on probation or suspension from another academic institution will not normally be considered for admission.

An applicant who has attended one or more institutions of higher learning must request *each registrar* to mail directly *to the Office of Admissions of the University* a transcript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable college work (*C* or better in academic courses from an accredited institution) at the time the application is submitted, he or she must request that the high school record and College Examination Board SAT or ACT test scores be sent to the Office of Admissions.

Students from Foreign Institutions

Required Records

At the time the application is sent, the applicant must request the educational institutions previously attended to send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies that are sent should be accompanied by an English translation completed by an independent agency.

Consideration will be given to academic documents delivered by the student if circumstances prohibit the receipt of official records.

Language Test

Students whose native tongue is not English are *required* to take the TOEFL (Test of English as a Foreign Language) or the ALIGU (American Language Institute, Georgetown University) test. (ALIGU tests are sometimes given overseas at U.S. Embassies.) Students receiving a grade of 550 or higher on the TOEFL or 85 in the ALIGU test will not be required to take the University's English placement test or enroll in the English as a Foreign Language program. Foreign students abroad should consult with the nearest U.S. Embassy for information on arrangements for taking the ALIGU test. Those interested in TOEFL should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08541, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for either the TOEFL or the ALIGU test does not constitute application for admission to George Washington University.

The TOEFL *Bulletin of Information*, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test, lists of examination centers, examination dates, and an application blank. On the application for the test, the student should specify that the scores be sent to the appropriate admissions office at this University (see Admission to Undergraduate Study, page 13, or Graduate Admission Procedure, pages 28, 34, and 36).

An admitted international student whose TOEFL score is below 550 will be required to take a test in English as a Second Language, administered by the George Washington University, prior to registration. Results of this test will determine the level of English instruction (see Special English Courses for International Students, below) or other courses the student will be permitted to register for in the program of study. If the knowledge of English is inadequate to enable the student to undertake the normal academic load, the student will not be permitted to register for any courses other than English (or English plus a reduced technical load) and will be required to study English on a full-time basis. Students in this category should therefore expect to take a longer period of time to complete their graduation requirements than students who are not obliged to complete the additional English courses.

International students already in the United States may take a locally administered George Washington University English placement test in lieu of the TOEFL or ALIGU test. A $10 fee is charged for this examination. Because this test is not given on a regularly scheduled basis, arrangements should be made by contacting:

Dr. Shirley M. Wright, Director
English for International Students
George Washington University
Washington, D.C. 20052
(202)676-7136

Financial Certificate

If a student plans to enter or remain in the United States to study at this University and the visa status will be either student (F) or exchange visitor (J), a Form I-20 or DSP-66 cannot be issued until the student has been admitted to the University and has completed a George Washington University Financial Certificate satisfactorily. The Financial Certificate (Form 212), required by the Office of Immigration and Naturalization, is a document that may be obtained from the School of Engineering and Applied Science. It requests information about the resources (money) available to the student to support his or her educational and living expenses while in the United States. The Certificate should be accompanied by supporting documents such as bank statements or letters from governments authorizing scholarship awards.

Special English Courses for International Students

The extensive experience of the Department of English with the language needs of international students has been synthesized into a comprehensive English Language Program that includes the following courses.

English as a Foreign Language

15 **Intensive Basic English** (0)
Introduction of basic grammatical structure through oral drill and practice and of basic practical vocabulary. Course meets 15 class hours and 5 monitored laboratory hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of 7 semester hours; laboratory fee, $35.

20 **Intensive Lower-Intermediate English** (0)
Continued basic grammar, reading, and vocabulary development; emphasis on oral skills. Course meets 17 class hours and 3 monitored laboratory hours per week. Students registered in EFL 20 will not be permitted to register for

any other academic course. Tuition is charged at the rate of 7 semester hours; laboratory fee, $35.

30 **Intensive Intermediate English** (0)
Introduction of complex grammatical structures, intensive reading, paragraph-level writing, and further vocabulary development and oral practice. Course meets 18 class hours and 2 monitored laboratory hours per week. Students registered in EFL 30 will not be permitted to take additional academic work unless approved by the adviser. Tuition is charged at the rate of 7 semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0)
Comprehensive review of grammatical structures and enlargement of vocabulary through use of unadapted and technical reading material; development of effective reading strategies; composition focusing on outlining and techniques of exposition. Twenty hours per week. Students registered in EFL 40 will not be permitted to take additional academic work unless approved by the adviser. Special-purpose sections are offered with business or technical emphasis. Tuition is charged at the rate of 7 semester hours.

45 **Semi-Intensive Higher-Intermediate English** (0)
Practice in composition writing; selective review of problematic grammatical structures; introduction to research techniques; development of reading and speaking skills and expansion of vocabulary through use of unadapted reading materials. Ten class hours per week. Tuition is charged at the rate of 5 semester hours.

50 **English Composition/Research Methods for International Students** (3)
An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Students registered in EFL 50 must register for a full academic load. Special-purpose sections are offered with business or technical emphasis. Special fee, $25.

60 **Advanced Oral Communication** (3)*
An advanced-level conversation course for international students who show a high degree of academic proficiency in English. Development and practice of conversational skills using contemporary topics from newspaper and magazine articles, films, interviews, and guest lectures. Four class hours per week. Special fee, $25.

The language laboratory is available to all students in the English Language Program. The laboratory contains a library of tapes that accompany the printed texts and a variety of listening and recording equipment, including individual recording and playback equipment.

Admission to a particular English class is determined by a suitable series of tests.

The English Language Program is administered by the Division of Continuing Education and Summer Sessions and is offered in cooperation with the Department of English, Professor J.P. Reesing, Jr., Chairman. Dr. Shirley M. Wright is the Director of the English for International Students Program.

Readmission

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer session exclud-

* Not required for degree

ed) must apply for readmission. Final dates for applying are the same as those for undergraduate admission (see page 14) or graduate admission (see pages 28, 34, and 36). If the student applies as a degree candidate and was previously registered as a nondegree student, or if a student has attended one or more higher institutions while absent from the University, the student must have complete, official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time he or she last registered at this University and who has not since registered at another academic institution.

Advanced Standing

Credit by Examination

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned toward partial fulfillment of the engineering curriculum upon admission to the University for each or any combination of the following:

College Entrance Examination Board Advanced Placement Tests (APT)—Credit is assigned for examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08541, or Box 1025, Berkeley, Calif. 94701.

College Entrance Examination Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: General and Subject. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 47 subjects.

New Students—Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate credit for the General Examinations in the social sciences (6 semester hours) and humanities (6 semester hours) passed at the 50th percentile or above (college sophomore norms); such credit is assigned in partial fulfillment of the 18 semester hours required in the humanities and social sciences. Credit is not assigned against the engineering curriculum for CLEP General Examinations passed in the areas of mathematics, natural sciences, or English composition.

Credit is assigned for the CLEP Subject Examinations that are applicable to the School's curricula and are passed at the level recommended in the College Board model policy.

Registered Students—A candidate for a degree (i.e., a student already registered at the University before taking the CLEP Examinations) must seek departmental approval prior to taking the CLEP Examination for credit. Credit may not be earned by passing the Examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the Examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, N.J. 08541.

Department Examinations for Waiver or Credit—Registered SEAS students may also take examinations in some departments for waiver of or credit for a specific course (see Fees, p. 215) upon approval of the appropriate department chairman; before the test is administered, the student must have demonstrated sufficient preparation to warrant being given the test. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

Make-Up of Credit for Waived Courses

If a course required by the engineering curriculum is waived, the corresponding semester hours of credit must be earned by satisfactory completion of a university-level course, either technical or nontechnical, that is approved by the student's faculty adviser or Department Chairman.

Waiver of the English Course Requirement

A waiver of the English course requirement in the core curriculum will be granted to those who achieve a score of 650 or higher on the English Composition Achievement Test of the College Entrance Examination Board or a score of 58 or higher on the Test of Standard Written English (TSWE) portion of the SAT.

Credit from Institutions of Higher Learning

When no duplication is involved either through course work or examination, advanced standing may be granted for work successfully completed at accredited institutions of higher learning. Credit will be granted only when such work meets the requirements for the degree sought at this University. Work of low caliber (*D*, or the equivalent, or lower) will not be considered for transfer.

Although there is no strict limit to the total amount of transfer credit that may be assigned, a student must satisfy the residence and course requirements for the degree sought at George Washington University. Students should complete a Transfer of Credit worksheet, available in the SEAS Admissions Office, indicating their request for transfer credit and present the worksheet to their adviser for final approval.

Credit from Service Schools

A limited amount of credit may be assigned for selected service school instruction received since 1941. No more than 30 semester hours may be assigned for a combination of service school training and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records indicating courses successfully completed, with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces*, which is used as a reference in determining transfer credit.

Regulations

Regulations regarding Registration, Fees, and Finances *are stated on pages 214–19; other University regulations, on pages 226–30.*

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular attendance is required. Students may be dropped from any course for undue absence.

Students are expected to attend every meeting of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, including work missed because of absence. Excuses for absences from examinations that have been announced in advance can be obtained only by written application to the instructor in charge of the course.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 21 semester hours. A student employed more than 24 hours a week who is not on probation may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the adviser's permission. Students on probation may not register for more than 12 semester hours during the period of their probation.

Advisory System

Every entering undergraduate student is assigned a permanent faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, the achievement and maintenance of satisfactory scholastic performances, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, students must consult with their adviser in all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the Dean, Associate Dean, Department Chairman, and adviser concerning any student problems. Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final reponsibility for a student's action lies with the student.

For the guidance of the student and the adviser, beginning freshmen who have not waived English Composition 9 or 10 through their English Composition Achievement Test scores or the TSWE (see page 19) or who have not received credit for a college-level calculus course must take the placement examinations in English and mathematics. A student who is deficient in

mathematics may be required to take remedial work. Results on the English placement test determine the level of the English course the student will take.

Scholarship

For scholarship requirements for graduation, see Graduation Requirements, page 24.

Grades—Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal, or Failure to Take the Final Examination. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course.

SEAS students may not take courses required for graduation on the pass/no pass (*P*/*NP*) grading system. They may, however, take courses outside their regular engineering academic program under this grading system.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. A grade of *I* that is not removed after one calendar year will be changed on the permanent record to a grade of *F*. A course in which a student receives an *F* in this way must normally be repeated. The grade to which the *I* is changed will be applied to the grade report for the semester or summer session during which the change is made for the purposes of determining probation, suspension, quality-point index, and so forth.

All grades received by a student at George Washington University, regardless of his or her status (i.e., degree, nondegree, or College Program for Secondary School Students), will count in the SEAS quality-point index if the courses are part of the SEAS curriculum.

Humanities, Social Science, Technical Elective, and Graduate-Level Course Grades—Courses taken in excess of the number required to fulfill the social science, humanities, or technical elective requirements (including graduate-level courses) are not included in determining probation/suspension/graduation/Dean's List status. Only those courses initially taken to meet the requirements will be included in computing the requirements of these categories.

Quality-Point Index—Scholarship is stated in terms of the quality-point index. The index is obtained by dividing the student's total number of quality

points by the total number of semester hours for which the student registered.

Quality points are computed from grades as follows: Each grade is assigned a numerical equivalent: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *D*, 1.00 point; *F*, no points. The quality points for a course are obtained by multiplying the credit hours of the course by the numerical equivalent of the grade achieved. Courses marked *W* or *I* are not considered in determining the index. Courses marked *I* will be included in the quality-point index once the *I* is converted to a regular letter grade. This grade will be included in the quality-point index for the semester in which the grade is assigned. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities (see page 231).

Grades of I or P/NP—If a grade of *I* is not changed to a letter grade of *A*, *B*, *C*, *D*, *F*, or Z within 30 days, then decisions on probation, removal from probation, suspension, Dean's List, and graduation will be made with the information on hand, in conformance with SEAS regulations, excluding the *I* grade(s).

Students whose status of probation or suspension depends on a grade of *P* are given 30 days to have the grade changed. If not changed by the end of that period, the P will be considered a C for probation, suspension, graduation, Dean's List purposes, and a grade of *NP* will be considered an *F*. Students may not be considered for the Dean's List with a *P* in their record for the semester in which the *P* was received.

Mid-semester Warning—At the end of the seventh week of each semester, instructors are expected to report to the Dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice, students must consult with the appropriate instructor and their adviser immediately. The adviser may prescribe diagnostic tests or remedial study, or both, to be completed before the end of the current semester.

Probation—A full-time student (one taking 12 semester hours or more) will be placed on probation if his or her quality-point index is less than 2.0 for one semester or if he or she receives two or more grades of *F* in one semester or summer session. A part-time student (one taking fewer than 12 semester hours) will be placed on probation if his or her quality-point index is less than 2.0 or he or she has received two or more grades of *F* when he or she has accumulated 12 semester hours over more than one semester or summer session. For academic purposes, a new grading period will begin once this accumulation is reached.

Students on probation who receive a quality-point index of 2.0 or better (for 12 or more credit hours) during the semester on probation but also receive a grade of *F* will be placed on continued probation. Students in this category who receive two *F*s will be suspended.

Removal from Probation—A full-time student will be removed from probation when his or her quality-point index is 2.0 or more with no grade of *F* during the semester on probation. A part-time student will be removed from probation when his or her quality-point index is 2.0 or more and he or she receives no grade of *F* for the next 12 semester hours after being placed on probation.

Suspension—The following cases constitute grounds for suspension: (1) receipt of two grades of *F* or Z, or both, any time during a probation period (part-time students receiving two grades of *F* or Z, or both, while on probation will be suspended at the time of receipt of the second of these grades); (2) placement on probation in two consecutive semesters (or the equivalent for

part-time students); (3) receipt of four grades of *F* in any semester (or the equivalent for part-time students); (4) placement on probation for a third time, whether or not the probation periods are consecutive; (5) accumulation of a quality-point index of (a) 1.5 or less at the end of the sophomore year or upon completion of the 63rd credit in the student's curriculum, (b) 1.9 or less at the end of the junior year or upon completion of the 97th credit in the student's curriculum, or (c) less than 2.0 at any time during the senior year.

Department faculty may designate additional courses to be taken and grades to be received by students who fail to meet but come close to meeting the graduation requirements. Suspension may be held in abeyance until the conditions are or are not met.

Students admitted on probation will be suspended if they do not attain a 2.0 GPA during their first semester (12 or more credit hours) or if they receive 2 or more grades of *F* during the period.

Dean's Honors and Commendation Lists—The Faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List and a Dean's Commendation List, which contain the names of candidates for undergraduate degrees whose scholastic achievements satisfy all of the following requirements while enrolled in an approved engineering curriculum:

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.5 or higher for the Dean's Honors List and a quality-point index of 3.0 or higher for the Dean's Commendation List, with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken against the student.

The grades used to compute the quality-point index for eligibility for the Dean's Honors and Commendation Lists are those used to meet the SEAS graduation requirements. A student who receives a grade of *I* during a semester will not be placed on the Dean's Honors or Commendation List for that semester unless the *I* is removed no later than one month after the end of the marking period and the student continues to meet all the requirements for the Dean's Honors or Commendation List.

Note—Grades discussed in the paragraphs above include all grades earned at George Washington University and through the Consortium universities while the student is enrolled at George Washington University. The grades considered are for academic courses taken in fulfillment of degree requirements and as prerequisites for degree requirements, and not for other courses that may be taken for remedial or deficiency reasons. (For example, EFL courses numbered 45 and below will not be considered for purposes of probation, suspension, or Dean's List.)

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the Associate Dean. The Associate Dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the Associate Dean.

Graduation Requirements

See page 227 for general requirements for graduation.

Residence

A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the Dean to study elsewhere, the work of the final year must be completed in residence.

Scholarship

To be eligible for graduation a student must have (1) a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semesters of the curriculum and (2) a 2.00 overall average for the entire engineering academic program taken at SEAS.

Honors

With Distinction—A bachelor's degree may be conferred "With Distinction," at the discretion of the Faculty, if a student attains a quality-point index of 3.50 or higher on all work taken at this institution that applies to his or her engineering program. To be eligible for this honor, a student must have completed at this institution at least one-half of the work required for the degree.

Special Honors—A bachelor's degree may be conferred with "Special Honors," at the discretion of the Faculty, for outstanding achievement in the student's senior-year work on recommendation of the Faculty, under the following regulations:

1. The student must have candidacy for Special Honors approved by the department chairman representing the major field not later than the beginning of the senior year.
2. The student must meet such other conditions as may be set at the time candidacy is approved.
3. No student will be awarded Special Honors unless a quality-point index of a least 3.00 is achieved on all work taken at this institution that applies to his or her engineering program.
4. To be eligible for Special Honors a student must have completed at this institution at least one-half of the work required for the degree.

Undergraduate Curricula

The four-year undergraduate curricula lead to the degree of Bachelor of Science, with parenthetic designation of the major—for example, Bachelor of Science (Electrical Engineering). Students who are deficient in preparation require a longer period; those who are admitted with advanced standing or who attend summer sessions can complete the requirements in less time.

The program of the first four semesters (core curriculum), with minor exceptions, is common to all curricula and provides the essential broad base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with an appropriate background in the humanities and social sciences (see below).

A minimum of 130 semester hours is required to qualify for the degree. Certain options may require more than the minimum. However, students are encouraged to elect additional course work above the required minimum to the extent that their interests and the School's offerings permit.

Degrees are offered in Civil Engineering, Computer Science, Electrical Engineering, Mechanical Engineering, and Operations Research and Computational Science. Students in Mechanical Engineering may select options in Computer-Oriented Mechanical Engineering and in Energy Resources and Power-Oriented Mechanical Engineering. Electrical Engineering provides options in Computer Engineering and Premedical Engineering.

For the guidance of the student and the adviser, beginning freshmen who have not waived English Composition 9 or 10 through their English Composition Achievement Test scores or the TSWE (see page 19) or who have not received credit for a college-level calculus course must take the placement examinations in English and mathematics. A student who is deficient in mathematics may be required to take remedial work. Results on the English placement test determine the level of the English course the student will take.

Preregistration

Students are encouraged to preregister for courses for the following semester. They are cautioned, however, that preregistration in a program of courses is predicated on satisfactory completion of all prerequisites for the courses and on meeting scholastic requirements.

The School reserves the right to cancel the preregistration of any student who has not met the requirements for satisfactory academic performance.

Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students assists them in acquiring knowledge that will permit understanding of the social and humanistic elements of the past and present and analysis of problems facing society today. The ultimate goal is to help the engineer have a better understanding of society and an appreciation of the engineer's role and responsibilities within it.

Since the education of an engineering student is, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should not emphasize technical aspects and skills but should consist of courses that broaden the student's outlook. As a consequence, courses in subjects such as accounting, finance, industrial management, introductory languages, and personnel administration should not be included in the humanities and social sciences program. On the other hand, courses in areas such as anthropology, economics, geography, history, literature (including foreign-language literature), philosophy, political science, psychology, and sociology are considered appropriate.

With the assistance of their faculty adviser, engineering students are required to prepare a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours and must be approved by both the adviser and the Department Chairman, using the appropriate form obtained from the School's Admissions Office.

Modern Laboratory Facilities and Research Opportunities

Laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged so that they supplement each other.

The learning experience is made more meaningful when coupled with research activities. Students may involve themselves in the various kinds of research activities in progress at SEAS. Research is being conducted in structural mechanics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

SEAS provides a wide variety of computing facilities for student and faculty use. Located on the fourth floor of Tompkins Hall, the SEAS Computing Facility includes an HP 3000 computing system with 12 time-shared interactive CRT terminals and remote telephone access; 14 Apple microcomputer disk-based computer systems; 8 Apple IIIs; 4 micro-PLATO terminals; a VAX 11/780 computing system, primarily intended for color and black-and-white computer graphics research; a Ramtek 9400 high-resolution color display; and a laboratory for instruction in microprocessor software and hardware development.

A wide variety of high-level languages, as well as machine and assembly languages, are supported. The Facility provides technical and operational assistance to all users during the normal operating hours of 12 noon–10 p.m. Monday–Thursday and 12 noon–6 p.m. Friday–Sunday.

Additional computing facilities, not under the purview of the SEAS Computing Facility, are available to students and faculty at the Center for Academic and Administrative Computing (see pages 231–32) and throughout the various specialized laboratories in SEAS.

The various laboratory facilities available to complement classroom study and conduct research also include an MTS random-cycle fatigue testing system; a fully instrumented wind tunnel; a combined water tunnel and circulating water channel; a water pollution laboratory; an air pollution laboratory; a soil and foundation engineering laboratory; electrical engineering laboratory with oscilloscopes, signal generators, digital multimeters, power supplies, and other related equipment; communications microwave and laser laboratory; a microprocessor laboratory with modern microcomputers (Imsai Z80); a digital computer laboratory with modern microcomputer trainers (6800 Microprocessors); electrical energy and power laboratory; control systems laboratory; interactive systems laboratory; computer simulation laboratory; a materials science and engineering laboratory with an electron-scanning microscope; a thermal science laboratory; combustion nondestructive testing laboratory; engineering design laboratory; and general mechanical engineering and applied mechanics laboratories. Arrangements can also be made for use of special equipment at various government laboratories, such as the Naval Research Laboratory, the National Bureau of Standards, and the National Aeronautics and Space Administration.

Graduate Study

The School of Engineering and Applied Science offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science and to the professional degrees of Engineer and Applied Scientist.

In its graduate programs as in undergraduate study, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual student by concentration on principles and their application rather than by encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has established a formal program of studies and for which there are adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the Programs of Study and Courses of Instruction section of this Bulletin.

Master's Degree Programs

The student's program may provide for broad coverage in a variety of fields or may be designed to provide concentration in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). With the approval of the department, the student may elect an optional program without a thesis that



consists of a minimum of 33 semester hours of approved graduate courses. All master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an adviser. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the appropriate department chairman.

Admission

Admission to graduate study toward a master's degree requires an appropriate bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, such as may be indicated by undergraduate grades, Graduate Record Examination* scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an Unclassified Student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he or she may be admitted directly to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he or she is deficient. In no case may the undergraduate deficiency courses thus taken fulfill any part of the requirements for the master's degree.

For additional admissions requirements for the degrees of Master of Engineering Administration and Master of Science in the Department of Engineering Administration, see pages 169, 178, and 184; for the degree of Master of Science in the Department of Operations Research, see page 200. Candidates for the degree of Master of Science in the Department of Electrical Engineering and Computer Science must have satisfied specific undergraduate requirements, depending upon the area of concentration.

Admission Procedure

Admission application forms are available from the School of Engineering and Applied Science. They must be submitted with the nonrefundable application fee of $35 to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request that each educational institution attended since high school graduation send an official transcript of the student's record directly to the Manager of Engineering Admissions. Although GRE scores are not required, the applicant who has completed the GRE should request that the scores be sent to the School. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are outlined on pages 15–17.

Normally, graduate students who have been suspended must wait at least one year before applying for readmission.

*Graduate Record Examination (GRE) scores are not required for admission to SEAS, however students who have taken the GRE are encouraged to submit their test results.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

English Language Requirements for International Students

If a student's native language is not English, the student must demonstrate proficiency in English before a decision will be made on his or her admissibility. The Test of English as a Foreign Language (TOEFL) and the American Language Institute of Georgetown University (ALIGU) test are recognized by George Washington University. The results of one of these tests must be forwarded by the institution administering the test.

Program Assignments Based on English Test Scores—Admitted students achieving a score of 550 or higher on TOEFL or 85 or higher on the usage test of the ALIGU will not have to take any additional English tests to determine the technical program they will follow at the School of Engineering and Applied Science.

International students who are admitted and whose scores range between 425 and 550 on TOEFL or between 55 and 84 on the usage test of the ALIGU will be required to take the George Washington University English Proficiency Test to determine the level of the English course to be taken and the maximum number of technical courses, if any, that can be taken in any semester. Students admitted with English requirements should expect to spend more than the normal amount of time in completing their studies at the University than do native (U.S.) students.

International students who score below 425 on TOEFL or below 55 on the ALIGU usage test will not be admitted to the University in full degree status. However, international students seeking admission to the School who have met all of the normal technical requirements for admission *with outstanding academic records* but do not meet the English language requirements may be admitted on a provisional admission basis. Such students may enter full admission status only when they have successfully completed the level of EFL 30 (see page 17) within one calendar year of the date of registration.

International students transferring from an academic institution in the United States or from another English-speaking institution, or who have demonstrated English proficiency at those institutions, may be admitted without a TOEFL or ALIGU test at the discretion of the admitting officer, but they may be required to take either the George Washington University English Proficiency Test or an English composition placement test prior to registration.

International students in the United States who are able to schedule the English Proficiency Test at George Washington University may use the results of this test in lieu of the TOEFL or ALIGU usage test.

Transfer Credit

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy master's degree requirements in this School. However, students must, with the approval of their adviser, petition the appropriate Department chairman for such a transfer. Credits used in obtaining a previous degree may not be used for another degree at SEAS.

Registration

A graduate student may register for classes upon presentation of an official letter of admission or a Student Identification Card from the previous semester. No registration is accepted for less than a semester or one summer session.

Concurrent registration in this School and in another institution not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., or another division of this University requires the written permission of the Deans concerned *prior to registration*. Allowance of credit for work completed concurrently at another institution is at the discretion of the Dean upon approval by the student's adviser. The necessary forms for requesting concurrent registration are available from the SEAS Admissions Office.

Dates of registration are stated in the Calendar, page 4, and hours and procedures are stated in the *Schedule of Classes* that is published in advance of each semester.

Preregistration

Students are encouraged to preregister for courses for the following semester. Students are cautioned, however, that preregistration in a program of courses is predicated on satisfactory completion of all prerequisites for the courses and on meeting scholastic requirements.

The School reserves the right to cancel the preregistration of any student who has not met the requirements for satisfactory academic performance.

Continuous Registration/Leave of Absence

The School has specific rules governing continuous registration. Students may register in one of the following categories: (1) Inactive Status Leave of Absence—(a) while awaiting graduation (all other requirements completed), (b) while attending classes at another institution, (c) while temporarily transferred out of the area (e.g., military TDY), (d) for temporary medical problems, or (e) for cooperative education work assignment—or (2) Continuous Research (1–12 semester hours)—(a) to take the comprehensive or qualifying examination or (b) to complete thesis or dissertation research. Students who wish to register in one of these categories should contact the School's Admissions Office.

Master's Thesis

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course (299), the candidate must submit the thesis area to the appropriate department chairman, on the form obtained from the department office and approved by the faculty adviser. The candidate must submit the thesis title to the Dean, on the form available in the School office, at the beginning of the semester of expected graduation.

Registration in the thesis course sequence 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. Students may consult their adviser, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis course 300. In the event a thesis is unfinished on the date specified, the student will be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis course 300 and pay tuition as for a repeated course. The overall time limit for earning the degree (see page 33) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the appropriate department office. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Optional Master's Program Without a Thesis

With the approval of the appropriate department, a student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses.

Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the examination satisfactorily, the student's graduate status terminates.

Regulations

Regulations regarding Registration, Fees, and Finances *are stated on pages 214–19; other University regulations, on pages 226–30.*

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. They may attend only those classes for which they are registered. Students are expected to attend every meeting of the course in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

Scholarship

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal, or Failure to Take the Final Examination.

Students who receive two grades of *F* or *Z*, or a combination of both, or three grades below *B* are barred from further enrollment in graduate courses and, ordinarily, will not be readmitted to graduate study.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his or her control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete that is not removed within one calendar year is automatically changed to an *F*.

A student may not repeat for credit a course in which he or she has received a grade of *C* or above, unless required to do so by the department concerned. A written statement requiring the student to repeat such a course for credit must be submitted to the Registrar by the appropriate department chairman.

Pass/No Pass Grading System—SEAS students may take SEAS courses under the pass/no pass grading system, but credit for such courses cannot be used toward any degree program in SEAS.

Graduation Requirements

Thesis—In addition to 6 semester hours of acceptable thesis, a student may graduate with either:

1. 24 semester hours of *B* or better with no more than two grades below *B*, of which only one *F* is permitted; or
2. A 3.00 quality-point index for a minimum of 24 semester hours with no more than two grades below *B*, of which only one *F* is permitted.

Nonthesis Option—A student may graduate with either:

1. 33 semester hours of *B* or better with no more than two grades below *B*, of which only one *F* is permitted; or
2. A 3.00 quality-point index for a minimum of 33 semester hours with no more than two grades below *B*, of which only one *F* is permitted.

Quality-Point Index—Scholastic standing is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *F*, no points, for each semester hour for which the student registered. Courses marked *W* or *I* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses taken at other institutions are not considered in

computing the quality-point index, with the exception of courses taken at one of the Consortium universities.

Residence and Continuous Study

All work for the degree must be done in residence on the campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the master's degree program under whatever conditions and regulations are in effect at that time.

Time Limits

A full-time student in the master's program is allowed a maximum of three calendar years (excluding the time spent taking only English as a Foreign Language courses) to complete all degree requirements, from the date of first graduate-student status registration in prerequisite or graduate courses. A part-time student in the master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an Unclassified Student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman and approved by the Dean.

Professional Degree Program

The School of Engineering and Applied Science has established the professional degree program to provide an educational program for those students who are interested in pursuing course work beyond the master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the professional degree program leads to the degree of Engineer or of Applied Scientist.

In the professional degree program, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual by concentration on principles and their application. This approach should provide the students with a technical flexibility to enable them to adapt successfully to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements.

The professional degree program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Professional Degree Study Programs

The professional degree program provides graduate study in those fields of engineering or applied science in which the School has established a formal program of studies and for which there are adequate facilities and resources. Upon approval, the student may select courses in other departments of

instruction in the University to serve specific needs or objectives.

The student's program may provide broad coverage in a variety of fields or concentration in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a master's degree. Students whose graduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Admission

Admission to graduate study toward the professional degree requires an appropriate master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience. The Department of Electrical Engineering and Computer Science requires candidates for the professional degree program to have had two years of professional experience after having received the master's degree.

Requirements

Engineer—To study toward the degree of Engineer, an applicant must possess a master's degree and a bachelor's degree in an area of engineering.

Applied Scientist—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in either engineering, mathematics, or natural science and a master's degree in either engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

Admission Procedure

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted with the nonrefundable application fee of $35 to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 15 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of the student's record directly to the Manager of Engineering Admissions. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are on pages 15–17.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

Transfer Credit

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*) beyond a master's program, which must have been earned in the five years preceding the start of study toward the professional degree, may be accepted in transfer

when applicable to satisfy professional degree requirements in this School. However, students must, with the approval of their adviser, petition the appropriate Department Chairman for such a transfer. Credit used in obtaining a previous degree may not be used as transfer credit.

Program of Study

Upon admission, the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of studies of each professional degree candidate must be approved by the student's adviser and the appropriate Department Chairman.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses as an Unclassified Student before being admitted to professional degree candidate status. In no case may courses thus taken fulfill any part of the requirements for the professional degree.

Each individual department may require the degree candidate to undertake and defend the results of a technical design project, a development problem, or the preparation of a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated.

In no case, however, will this project be more than 6 semester hours out of a minimum of 30 semester hours.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of 3.00 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the first graduate student status registration in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an Unclassified Student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Upon expiration of leave of absence, readmission is required under the conditions and requirements in effect at the time of the student's readmission.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Interrelationship with the Doctoral Program

Candidates for the Doctor of Science degree or professional degree who are in good academic standing may, with the approval of the faculty adviser and department chairman, transfer from one degree program to the other if they meet necessary qualifications and requirements as specified by the appropriate department.

Residence and Continuous Study

All work for the degree must be done in residence on the campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and he or she must apply for readmission to the professional degree program under whatever conditions and regulations are in effect at that time.

Doctoral Degree Program

The School of Engineering and Applied Science offers a program of advanced study and research leading to the degree of Doctor of Science. This program is limited to those fields in engineering or applied science in which a discipline has been established and for which the University has or can arrange adequate resources.

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest.

The program for the degree is divided into two stages. The first—made up of a study of interrelated fields of learning that supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination.

Admission to Doctoral Study

A satisfactory master's degree from an accredited institution is required together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

Admission Procedure

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted with a nonrefundable application fee of $35 to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052. The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's

qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which he or she received the master's degree; one of these, if possible, should be from the master's adviser. The letters should be addressed to the appropriate department chairman.

English language and other pertinent requirements for international students are given on pages 15–17.

Language Requirement

The importance of scientific and technical contributions originating from foreign countries is emphasized. Some areas of study demand the capability of reading appropriate literature in a foreign language. In such situations individual departments have the option of requiring reading knowledge of such a language.

Tool Requirement

In addition to or in lieu of the language requirement, an examination in a tool requirement (*e.g.*, computer programming) may be established by the various departments.

Study for the Qualifying Examination

Upon admission to the first stage of the program (*i.e.*, study of interrelated fields culminating in the qualifying examination), the student is assigned a faculty adviser who directs his or her studies. The adviser approves appropriate fields of study to insure the student's breadth of knowledge and to support research in the central field of interest, gives advice concerning the scope and content of fields of study, and guides preparation for the qualifying examination. In some departments, instead of a faculty adviser a faculty committee may be appointed to approve programs, direct study, and carry out all other responsibilities of the faculty adviser. Programs of study are normally structured to include a major field of study and two minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond master's study is required. In many cases, particularly when the student undertakes a doctoral program in a field other than that in which the master's degree was obtained, the program of studies exceeds 30 semester hours.

Students admitted to doctoral study are encouraged to undertake one year of full-time study on campus. In general, the adviser will require the student to register for a minimum of 6 semester hours of course work in every semester except the summer sessions.

Transfer of Credit

Up to 6 semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements of this School, subject to the approval of the student's adviser and the Department Chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission. Credit for courses taken for a previous degree may not be transferred.

The Qualifying Examination

The purpose of the qualifying examination is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. (Some departments may administer a prequalifying examination prior to completion of the study program.) Qualifying examinations may be written or oral, or both, and are scheduled over a period of several days. They are conducted only during the fall and spring semesters on dates established by the departments and are administered by a faculty committee. Upon favorable report of the examiners to the Dean through the appropriate department chairman, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the faculty or, in special instances, an outstanding engineer/scientist who is not a member of the faculty.

The qualifying examination is the principal means used to determine the student's ability to qualify as a candidate for the doctoral degree and to enter the second stage of the program.

At the discretion of the committee that prepared the examination, the doctoral student may be given a second opportunity to qualify for candidacy in the event of failure in any part of the qualifying examination. In general, the entire qualifying examination must be retaken to qualify for candidacy.

Scholarship

To be admitted to the qualifying examination, the doctoral student must achieve an overall quality-point average of 3.20 (quality points are computed as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; and *F*, no points). No doctoral student may receive more than two course grades below *B*. If the student does receive more than two course grades below *B*, the graduate study is terminated and further enrollment is prohibited. Courses in which the student earns grades below *B* are not included in the total semester-hour requirement for the degree. Students who receive any grade below *B* are required to consult with their adviser for a review of their program of study and discussion of possible changes therein.

Research, Dissertation, and Final Examination

The student admitted to candidacy for the degree of Doctor of Science requests as Director of Research the member of the faculty under whom he or she wishes to conduct research. The faculty member may accept or reject such request. The research area is approved by the Director. Throughout the

remainder of the doctoral program, the candidate conducts dissertation research directly under the Director. However, the student is not precluded from consulting with other members of the faculty as may be required, on an informal basis, and may be encouraged to do so by the Director of Research. A committee of the faculty consisting of three members, including the Director as chairman, will advise in the final preparation of the dissertation. The Department Chairman appoints such a committee on the recommendation of the Director of Research. Work on the dissertation is equivalent to a minimum of 24 semester hours. See pages 214–15 for minimum hour-loads for doctoral students.

The Dissertation

A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The aim of the student in this stage of candidacy is the production of a dissertation that embodies the results of an extended original study and includes material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to publish the results of the research as soon as possible after he or she receives the degree and to submit copies of the published material to the Dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, developed, etc., from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 600 words) of the dissertation no later than the date specified in the Calendar (page 4). The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the department office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the Gelman Library, where bound copies are available for circulation.

The Final Examination

Upon acceptance of the dissertation by the committee, consisting of the Director and two other faculty members of this School, which has assisted in supervising its final preparation, the candidate is presented for the final examination. The final examination is oral and is open to the public. The candidate must demonstrate a mastery of the special fields of study and of the materials and techniques used in the research. The committee of examiners will consist of not less than five members, three of whom must be full-time faculty members. The committee may include qualified experts brought to the University especially to participate in the examination. The Director of Research serves as Advocate for the candidate. When the candidate satisfies

the examining committee of the high quality and originality of the candidate's contribution to knowledge as well as the mastery of the scholarship and research techniques of the field, the committee of examiners recommends the candidate for the degree of Doctor of Science. The final examination is conducted only during the fall and spring semesters. The candidate should consult with the appropriate department chairman as to possible dates for the examination.

Residence and Continuous Study

All work for the degree must be done in residence on the campus, except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the registration, and the student must apply for readmission to doctoral study under whatever conditions and regulations are in effect at that time. In case of incapacity or other legitimate reasons, the student may be granted a leave of absence of up to one year. Extension of such leave will require special request to and approval by the appropriate department chairman. During approved leave of absence, the student must maintain continuous enrollment. The time period for completion of all requirements for the degree will be adjusted on the basis of the approved leave of absence.

In general, one year of study is the minimum amount of time to be spent in preparation for the qualifying examination. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must be completed within seven years. After admission the student may apply for the qualifying examination whenever he or she feels properly prepared. A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree.



Special Programs

Institute for the Study of Fatigue, Fracture, and Structural Reliability

The basic objective of the Institute for the Study of Fatigue, Fracture, and Structural Reliability of the School of Engineering and Applied Science is to develop an interdisciplinary approach to fatigue research through close cooperation of research workers from different fields. The Institute deals principally with the study of the physical mechanism of damage initiation in order to establish principles for the rational design of metal alloys of superior fatigue performance on the one hand and to develop advanced methods of fatigue design and reliability on the other. Because of the large volume, past and current, of straight fatigue testing of standard test specimens in industrial, government, and university laboratories, no testing of this type is generally conducted by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. In addition to advancing interdisciplinary research, the Institute provides specialized training for graduate students.

The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

Institute for Management Science and Engineering

The Institute for Management Science and Engineering defines and develops new analytical management techniques required to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. The principal academic fields directly involved are operations research, mathematics, statistics, economics, and computer science.

The programs of the Institute are concerned with important educational and public-service needs for conservation of national resources. Such programs require full-time interaction among student, faculty, and staff in ways possible only at universities. Through its Program in Logistics, the Institute performs research leading to the development of a science of logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts. Other programs involve optimization, reliability, queuing, forecasting, and cost–benefit analyses.

Participation by faculty members and graduate students from all schools in the University is encouraged as consistent with the multidisciplinary objectives of the Institute. Qualified graduate students may obtain financial support through research assistantships, with thesis and dissertation efforts ordinarily being the major work responsibilities. Reliance is also placed on staff research specialists, and there are special provisions for substantial contributions from distinguished visitors from government, private industry, and other universities.

The Institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

Institute for Reliability and Risk Analysis

The objective of the Institute for Reliability and Risk Analysis is to promote basic and applied research in reliability theory and risk analysis within the framework of a university environment. In pursuit of this objective, participation by and interaction among faculty members, visiting professors, scientists from government and industry, and graduate students is sought.

Qualified graduate students may be supported through research assistantships; their major work efforts consist of research toward the dissertation.

The Institute sponsors seminars for the general public and the university community and publishes technical papers and other reports to disseminate research results.

International Water Resources Institute

The International Water Resources Institute was created to foster a multidisciplinary approach to the planning, development, and operation of water resources systems and the solutions to water resources problems on both the national and international levels.

The Institute emphasizes basic and applied research, technical development, transfer of knowledge, professional and scientific services, and special educational needs within the University and abroad.

The Institute supplies information to various government agencies and private concerns nationally and internationally and conducts seminars. It thus creates an international flow of knowledge about water resources problems and their possible solutions.

Institute for Information Science and Technology

The Institute for Information Science and Technology, of the Department of Electrical Engineering and Computer Science, operates as a multidisciplinary research organization with its foundation in the fields of science and engineering. It brings together the strength of disciplines from both the physical sciences and the social sciences, including law, education, government, psychology, political science, engineering, mathematics, geography, and others, in order to understand human machine interactions and to understand appropriate designs for effective information systems for the future. The Institute operates with a core staff and relies on faculty and research contributors from the University as well as a broad range of other sources from government, industry, and academe. Visiting scholars and fellows from government and industry fill important research positions while pursuing advanced studies.

The Institute is organized to conduct interdisciplinary educational and training programs by integrating mid-level scientists and managers into Institute research programs to provide them with greater insight into the latest research findings in the field of information science and technology. There is a deliberate mix of permanent and adjunct staff: government, industry, and university staff; practitioners and researchers; senior researchers and students—a cross-fertilization of the spectrum of skills and roles that can be brought to bear in the field of information science.

The Institute for Information Science and Technology produces research publications, grant and contract reports, and scholarly papers; systems designs and developmental demonstrations; continuing education programs, seminars, and conferences; and trained staff and alumni.

The GWU/NASA–Langley Graduate Program

George Washington University, in cooperation with the National Aeronautics and Space Administration's Langley Research Center, has a full-resident graduate engineering program at NASA-Langley in Hampton, Virginia, approximately 200 miles south of Washington, D.C.

The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA–Langley's extensive scientific and engineering facilities and equipment are used whenever feasible.

The program at NASA–Langley leads to the degrees of Master of Science and Doctor of Science (by special permission of the appropriate department chairman) and to the professional degree of Engineer in the fields of acoustics, aeronautics, environmental modeling (M.S. degree only), fluid mechanics and thermal sciences, solid mechanics and materials engineering, structures and dynamics, electrical engineering and computer science (M.S. degree only), and engineering administration (M.E.A. only).

Information regarding this program may be obtained from Professor John L. Whitesides, Jr., GWU/NASA Program, Mail Stop 169, NASA–Langley Research Center, Hampton, Va. 23665.

The GWU/NASA–Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established in 1971 through the combined efforts of the National Aeronautics and Space Administration's Langley Research Center and the George Washington University's School of Engineering and Applied Science. The objective of the



JIAFS program is to meet the nation's ever-increasing needs in the advancement of science, engineering, and technology and to prepare qualified students for careers in research, development, design, and teaching. The Institute, located at the Langley Research Center in Hampton, Virginia, is dedicated to the advanced training of students and professional engineers in acoustics, aeronautics, structures and dynamics, and other relevant areas and serves to provide a center for advanced research by bringing together researchers and scholars from these fields for the exchange of ideas and findings. It is also the purpose of the Institute to provide the necessary facilities for qualified researchers and scholars who want to engage in research work in these areas.

The organization of the Institute consists of a director, Robert Tolson, Chief Scientist, NASA-Langley Research Center, and a co-director, Harold Liebowitz, Dean of the George Washington University's School of Engineering and Applied Science.

The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research assets and facilities of the NASA-Langley Research Center. These opportunities also enable students to involve themselves in research projects that excite their interest and permit them to associate with prominent visiting members working on related problems. Most of the faculty and NASA scientists conduct research, and students take part in the intimate association of research and instruction from the day of their arrival. It is believed that the experience of the students during their stay at NASA-Langley Research Center will be highly rewarding and beneficial.

The current education and research programs are the following

Acoustics Program—This program is concerned with the problems of alleviating noise and with providing a technical base for design of acceptable aircraft and space vehicles, noise resistant structures, and ground transportation systems. Areas of research interest include boundary-layer noise, duct acoustics, jet noise, nonlinear problems in acoustics, structural response to noise, and mechanical and acoustical coupling problems.

Aeronautics Program—This program deals with advanced flight concepts of various types of aircraft, including areas of performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Specific research areas currently being investigated include aerodynamic analysis of jet augmented wings, theoretical fluid mechanics, performance, stability and control of aircraft, wind tunnel and flight testing of aircraft, airfoil aerodynamics, stall-spin characteristics of aircraft, and experimental evaluation of aircraft handling characteristics.

Structures and Dynamics Program– This program is designed to provide basic understanding and working knowledge of key areas pertinent to structures, solid mechanics, and dynamics technology, including computer-aided design, optimum design of aircraft and of aerospace and other structures, and the dynamic and aeroelastic response of large and complex structures, particularly large space structures. Emphasis is placed not only on these individual areas but also on their interface and interaction.

Participating in these programs are Graduate Student Research Scholar Assistants, faculty from George Washington University, scientists and engineers from NASA-Langley, and visiting scientists and engineers.

A number of Research Scholar Assistantships are available to qualified students seeking an outstanding opportunity for graduate study and research leading to the degrees of Master of Science and Doctor of Science in the fields of acoustics, aeronautics, and structures and dynamics. Applicants who are

awarded Research Scholar Assistantships receive stipends of up to $10,000 a year for a Master of Science degree and $11,000 a year for the Doctor of Science degree. Applications, a JIAFS brochure, and additional information may be obtained from Professor John L. Whitesides, JIAFS–George Washington University, Mail Stop 169, NASA–Langley Research Center, Hampton, Va. 23665.

Honors Research Program

An Honors Research Program has been established at the School of Engineering and Applied Science. Students who earn a grade-point average of 3.3 or above or who are admitted with a combined SAT score of 1250 and ranked in the upper 10% of their high school class are invited to participate. The Program has been created to recognize and reward the academically gifted student with the opportunity to obtain a broad and enriched professional education in engineering.

Students admitted into the Program are assigned to selected engineering faculty for academic advising and guidance. They are afforded opportunities to participate in a number of specially designed laboratory experiments in the various engineering disciplines and a series of seminars conducted by well-known engineers and scientists. They are permitted to carry an advanced-level engineering program and have an opportunity to earn up to 6 semester hours of credit in lieu of technical electives. A notation of participation in the Program can be made on the student's transcript.

Qualified students interested in applying for the Program should contact the Honors Research Chairman of the department in which the research is to take place.

Naval Reserve Office Training Corps Program

A Naval Reserve Officer Training Corps (NROTC) Unit will be established at George Washington University commencing with the fall semester 1984. The objective of the NROTC unit is to educate prospective officers for the Navy and the Marine Corps. Regular and Reserve commissions as Ensign (Navy) or Second Lieutenant (Marine) are awarded on successful completion of prescribed naval science courses and graduation from the University. A student completing the program and accepting a commission is required to serve on active duty for four years if commissioned as a Regular Officer or three years if commissioned as a Reserve Officer.

Admission to the NROTC Program is accomplished through either the *Scholarship* or the *College Program*.

1. **Navy–Marine Scholarship Program**—Students enter the program through the annual nationwide selection conducted by the Navy and the Marine Corps. Benefits include tuition, all textbooks, instructional fees, uniforms, and $100 per month for four years. Scholarship students are required to complete a naval science course each semester and to attend a leadership laboratory one period each week for eight semesters. There are three summer training periods of four to six weeks each, which include training at sea, and Officer's Candidate School for Marine-option midshipmen.

2. **Navy–Marine College Program**—This program is designed to prepare students entering as freshmen to qualify for appointment as officers in the Naval or Marine Corps Reserve. The Professor of Naval Science nominates individuals selected from students who apply for enrollment in the program, have the necessary qualifications, and pass the required physical examination. Students in this program are provided uniforms and naval science textbooks. During their third and fourth years, they receive a subsistence allowance of $100 per month. College Program students complete the same naval science courses as do the Scholarship Program students and are required to complete one four- to six-week summer training period during their last summer at the University. Freshman and sophomore students in the College Program are eligible to apply for the Scholarship Program when scholarship vacancies become available.

A student can enter both the Scholarship and College Programs as late as the junior year. Application can be made during the spring term of a student's second year. If accepted, the student attends a six-week summer Naval Science Institute and enrolls in the NROTC Program at the beginning of his or her third academic year.

Any student enrolled at George Washington University may take naval science courses with the approval of the Professor of Naval Science. Such enrollees are not NROTC students; however, they may be considered for enrollment in one of the above programs on request.

The NROTC enables college graduates to use their academic education in various military fields: for example, nuclear propulsion; civil and other engineering fields; supply, aviation, surface, and undersea warfare; and Marine Corps aviation or infantry. The Navy and the Marine Corps are especially interested in engineering degree candidates.

General Requirements for NROTC College Programs

Applicants for the NROTC Program must meet the following requirements.

1. At least 17 years of age and not to reach 27½ by June 30 of the college graduation year. (Students may enroll in the College Programs at 16 if the NROTC Unit commanding officer considers them mature enough to take naval science courses.)
2. U.S. citizenship.
3. Physically qualified.
4. Satisfactory record of moral integrity, academic studies, and extracurricular activities; potential officer characteristics.
5. No moral obligations or personal convictions that prevent conscientiously bearing arms and supporting and defending the Constitution of the United States against all enemies, foreign and domestic.
6. Accepted for admission as a civilian student at one of the colleges or universities participating in the NROTC Program. (Students attending an accredited college or university in the vicinity of a college or university with an NROTC Program may enroll in the College Program if class scheduling will permit. Such cross-enrollment must be approved by officials at both schools, the Professor of Naval Science, and the Chief of Naval Education and Training.)

Cooperative Education Program in Engineering

Cooperative education is a process of education that formally integrates the student's academic study with work experience in cooperating employer organizations. The usual plan is for the student to alternate periods of college study with periods of experience in appropriate fields of industry and government. The experience periods are considered an integral part of the student's education. Cooperative education students in a work assignment period are considered full-time students for purposes of housing and campus privileges. They are not considered as full-time students for Veterans Administration Benefits, financial aid, or visa purposes. Through the interaction of the study and work experiences, the student enhances academic knowledge, personal development, and professional preparation. The teaching faculty, the coordinators, and the employing supervisors share in the educational process of the cooperative student.

Advantages of Cooperative Education

Combines Theory and Practice—By coordinating the work experience in industrial and governmental organizations with the campus education program, theory and practice are closely integrated and students find greater relevance in their studies. As a result of this alternation between academic and industrial environments, students tend to understand the role and meaning of each environment, with a deeper appreciation for each.

Helps Finance Educational and Living Expenses—The students' earnings will contribute substantially to financing their education and living expenses, leading to independence and contributing significantly to self-esteem and confidence. Work experience usually increases in difficulty and responsibility as students progress through the academic curriculum, and the salary increases accordingly

Serves as a Bridge to the Future—Cooperative education helps markedly to orient students to the world of work. Most students are genuinely concerned about their future life work. They want to know more about the range of occupations open to them and the potentials and limitations of these fields. They want to know about the qualifications demanded and their own fitness. Through cooperative education programs, students have opportunities for exploring their own abilities in connection with real jobs, and they find a direct means of gaining information and guidance not only in the occupations in which they are employed but in a number of related fields as well. They have a chance to test their own aptitudes more fully than is normally possible on campus.

Increases Motivation to Achieve—The coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, greater interest in academic work develops. During the work periods there is a tendency for students to develop good work habits because their efforts as productive and salaried employees are rated by the employer.

Enhances Human Relationships—Because the work experiences involve the students in relations with co-workers who come from a variety of backgrounds, and because success in these jobs requires constructive relation-

ships with colleagues, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

Augments Development of Maturity—For many students the work experience contributes to an increased sense of responsibility for their own efforts, more dependence on their own judgments, and a corresponding development of maturity. In addition, the students' roles as team members in a real and productive working environment inculcate a seriousness of life and purpose that is often delayed for the traditional college graduate.

Responsibilities of the Cooperative Student

The cooperative student working in association with the professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the George Washington University School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's work performance to the Cooperative Program Coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

The cooperative student must maintain continuous enrollment in the School for each semester he or she is away from the School on a work period. Failure to do so breaks the student's registration, and he or she must apply for readmission to the undergraduate degree program under whatever conditions and regulations are in effect at that time.

Why Employers Participate in Cooperative Education Programs

Industry and government agencies have found that cooperative students are valuable employees. Generally speaking, they are alert and energetic young people who, stimulated by a definite goal, return more than a day's work for a day's pay. Graduates of the cooperative program represent a good source of well-trained manpower. The training period provides an opportunity for the employer to evaluate the student as a prospective permanent employee. Employers feel that this program is an important part of their effort to attract well-qualified employees. At the same time, the student is able to evaluate the employer in terms of future plans and interests. About half of the cooperative graduates establish such mutually beneficial relationships with their employers that they remain in permanent employment after graduation, with a substantial head start in their careers.

It is emphasized, however, that neither the student nor the employer is obligated for permanent employment after graduation. Industry and government agencies consider participation in cooperative education as a long-range investment rather than a current expense. As a partner with the University, the employer is engaged in a joint effort to develop young talent more fully, thus assuring better education for the student, improved utilization of the graduate, and greater cooperation with the University.

Scholastic Requirements

Students entering the program must be in good academic standing and usually must have completed at least two semesters of college-level academic study prior to their first full-time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for the employer.

Living Accommodations

Arrangements are made for students in the cooperative program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they also retain full student privileges and have access to all University facilities.

Work–Study Schedules

Individual student schedules are arranged with the various employers in Washington and other areas. Since each employer operates differently, special schedules are arranged that are mutually satisfactory to the student, the employer, and the School.

Generally, after the student has successfully completed the first year of study, a schedule is arranged with the employer. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. Beginning with the third year, students alternate between employer and classroom each semester for the next two years, returning to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students are arranged on an individual basis according to the number of semester hours transferred and the employer's requirements.

Tuition Aid

Under the Tuition Aid Program offered by certain employers, up to 50% of the cost of tuition, textbooks, and fees (exclusive of room and board) may be granted. If tuition assistance is received, the cooperative student has to agree to serve as an employee after graduation for a period to be determined by regulations in effect at that time. As a civil service employee, the co-op student is eligible for many federal benefits, including annual leave, sick leave, paid holidays, health benefits, and life insurance.

Applications

Applications for the Cooperative Education Program from registered or transfer students should be submitted at least 10 weeks prior to the beginning of the first work period. It is recommended, however, that applications be submitted four months in advance of the work period. Transfer students who meet admission requirements may apply for a work assignment during the summer or the semester just prior to their registration at this University.

Undergraduate 3:2 Dual-Degree Programs Combining Liberal Arts and Engineering

The School of Engineering and Applied Science has developed 3:2 Dual-Degree Programs in Liberal Arts and Engineering with the following accredited four-year degree granting institutions:

Bowie State College, Bowie, Md.
Chestnut Hill College, Philadelphia, Pa.
Georgian Court College, Lakewood, N.J.
Hampton Institute, Hampton, Va.
Hood College, Frederick, Md.
Mansfield State College, Mansfield, Pa.
Marywood College, Scranton, Pa.
St. Joseph's College, Hartford, Conn.
St. Mary's College, St. Mary's City, Md.
St. Thomas Aquinas College, Sparkhill, N.Y.
Virginia Commonwealth University, Richmond, Va.
Wheaton College, Norton, Mass.

These programs combine a basic liberal arts, math, and science education with a professional education in engineering in a unique, comprehensive learning experience.

Three: Two Dual-Degree Program students initially enroll in the program at one of the above institutions and pursue a three-year program covering social sciences, humanities, mathematics, physics, and chemistry, which helps the student develop broad cultural perspectives, analytic abilities, and communication skills.

After successful completion of the first phase of study, students then follow a two-year career program in engineering at the School of Engineering and Applied Science. During this phase of the study, students may specialize in any of the following areas of engineering, which are offered in George Washington University's regular four-year programs:

1. Civil Engineering.
2. Computer Science.
3. Electrical Engineering or the following options: Computer Engineering, Premedical Engineering.
4. Mechanical Engineering or the following options: Combustion and Environmental Engineering, Computer-Aided Design, Energy and Power, Fluid Mechanics and Thermal Sciences, Mechanical Engineering Design, and Solid Mechanics and Materials Engineering.
5. Operations Research and Computational Science.

Upon successful completion of the two-year engineering program at George Washington University, students are awarded two baccalaureate degrees: a B.S. or B.A. from the first institution and a B.S. in engineering from George Washington University. At this point the student may choose to enter engineering practice, continue studies for advanced degrees, or enter other professional areas, such as law, medicine, or teaching.

Dual-Degree Program students are also eligible to apply for the Cooperative Education in Engineering Program at George Washington University (see pp. 49–51). The student transferring to George Washington University will have completed the equivalent of two years of engineering. Thus the student would have the option of working during the summer and starting classes in

the fall or working for a full eight months prior to starting classes. Three:Two Dual-Degree Program students interested in applying for cooperative education at George Washington University should submit the appropriate application forms one year prior to actual transfer.

For further information on the 3:2 Dual-Degree Programs, contact the Admissions Office of the institutions listed above or Manager, Engineering Admissions, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, (202)676-6158.

Continuing Engineering Education Program

Today most engineers and their employers are well aware of the rapid advances of knowledge in science and technology. The inability to understand and to make timely applications of new technologies can mean both personal and corporate failure. To prevent this potential obsolescence, engineers must involve themselves in a continuing program of technical reading and organized learning.

The School of Engineering and Applied Science meets this need with a comprehensive program of noncredit courses. The program's objective is to increase the competence of practicing engineers rather than to grant further academic degrees. Staff reorganizations require many engineers to change their specialties or to take on additional duties within their present jobs. Continuing engineering education can provide the education and skills the engineer needs to effectively make these changes. Continuing engineering education also aids in qualifying for promotions and in maintaining certification in certain professional fields.

The program will present over 500 noncredit courses this year. About half of them last for five days (30 classroom hours); others are for two, three, or four days. Presentation of theory is often augmented by workshops to give registrants practice in the specific discipline. All courses stress practical applications. Students from all over the nation and from many foreign countries have participated in courses. The variety of experience and background of these students enriches the classroom discussions.

In 1976 and 1978 courses were presented in Europe to test the acceptability of this approach to education by the scientific and engineering communities. The very favorable response resulted in an expanded schedule with classes now held regularly in London, Amsterdam, Munich, and Berlin. In 1981 the program presented in the United States was extended to Mexico and Canada.

Subjects that have been presented in the Continuing Engineering Education Program include:

Computers

Configuration Management of Software Programs
Comparative Data Base Management Systems
Microprocessors and Microcomputers
Distributed Processing
Computer-Aided Preliminary Ship Design
Warehousing/Distribution Operation Using Computers
Computer Performance Evaluation
Minicomputers, Microcomputers, and Microprocessors for Non-Electrical Engineers
Computer Graphics Systems
Microcomputers in Control Systems

Computer Communications Systems and Networks
Computer-Aided Design in Manufacturing
Software Quality Assurance
ADP Security
Design of Digital Control Systems
Software Engineering and Quality Assurance
Voice Input/Output: Communicating with Machines with the Spoken Word
FCC Regulation of Computing Devices
Management of Embedded Computer Resources
Human Factors in Computer Graphics
Local Area Computer Networks
Parallel Picture Processing
Microcomputer Applications Workshop
Workshop in Data Communications for Microcomputers
Computer Analysis of Multispectral Data
Computerized Building Control Systems
Intelligent Robots: Integrating Microcomputer and Robotic Technology
Software Maintenance Technologies
Advanced Business Communications Networks
Selecting Small Computers for Government and Business
Cryptographic Methods for Data Protection
An Applications-Oriented Approach to Artificial Intelligence
Peripherals for Mini-, Micro-, and Personal Computers
Applying Remote Sensing Techniques to the Marine Environment
Increasing Software Productivity: Tools and Techniques
Computer System Architecture for Technical Managers
Managing Data Processing Systems
Introduction to Microcomputers
Introduction to Digital Computers
Reliability of Computer Software and Computing Networks
Electronic Computer Printing
Advanced Word Processing
Selecting and Applying 16-Bit Microprocessors
Interactive Computer-Based Systems Design
Programming in the C and UNIX* Environment

Electronics

Radar Systems and Technology
Electronic Display Technologies and Applications
Radiowave Propagation for Communications Systems Design
Digital Image Processing of Earth Observation Sensor Data
Advances in Electronics Technology
Radar Signal Processing
Digital Signal Processing
ECM and ECCM for Digital Communications
Lightning Protection
Solid-State Electronics for Non-Electrical Engineers
Digital Voice and Video
Sonar Signal Processing
Remote Sensing for Global Resource Applications
Fiber Optic Systems Design
Digital Electronics and Integrated Circuits for Non-Electrical Engineers
Electro-Optics, Fiber Optics, and Lasers for Non-Electrical Engineers
Hazardous Electromagnetic Radiation
Advanced Radar Technology
Mapping from Space: Techniques and Applications
Applied ECM
Grounding, Bonding, Shielding, and Transient Protection of Communications/Electronics Facilities
Applications of Transport Calculations
Radar ECCM
Electromagnetic Pulse
Radar Principles for the Non-Specialist
Radar Signal Processing and Automatic Detection

*UNIX is a trademark of Bell Laboratories.

Antennas for Radar, Avionics, and Electronic Warfare
TDMA Satellite Systems Engineering
Antennas and Arrays
Introduction to Kalman Filtering
Microwave Systems Planning
ESM, ECM, and ECCM Electronic Surveillance
Millimeter-Wave Radar
Radar Missile System ECCM
Advanced Topics in Digital Signal Processing
Public and Private Packet Switched Networks
Frequency Synthesizers
Laser Radar Systems and Techniques
Advanced Geological Remote Sensing
High-Frequency Spectrum
Agricultural and Forestry Applications of Remote Sensing
Integrated Circuit Engineering
Sonar System Design and Prediction
Fiber-Optic Systems for Military Applications
Fundamentals of Electronic Warfare
Weapons Technology
Design and Evaluation of Electronic Scanning Radar Systems
Monopulse Radar
Communication Receiver Design
DOD Aerospace Environment C^3I Perspectives

Mathematics, Statistics, Quality Control, Reliability, and Safety

Statistical Methods in Reliability
Risk and Reliability Assessment Using Modern Methods of Fault Tree Analysis
Nonparametric Statistics
Techniques for Standards and Calibrations Laboratories
Mechanical Reliability
Applications of Reliability and Risk Analysis
Analysis and Prevention of Materials Failure
Applied Statistical Theory
System Safety
Quality Control Engineering
Highway Accident Analysis and Reconstruction
Techniques of Forecasting and Time Series Analysis
Life-Cycle Cost Analysis
Reliability Testing
Bayesian Statistics for Engineers and Scientists
Statistical and Operations Research Methods
Reliability Engineering
Tools for the Data Analyst
Life-Testing and Burn-In Techniques
Mechanical Reliability and Optimum Probabilistic Design
Product Safety Management
Mechanics and Design of Impact Printing Devices
Electrical Safety: Shock and Arc Blast Burns
Hospital Systems Safety
Fault Tolerant System Design
Analysis of Covariance Using Statistical Computer Packages

Management and Information Science

Configuration Management
Writing Professional and Technical Communications
Microfilm Information Systems
Concepts and Applications of Program Management
Management of Programs and Projects
Computer Hardware and Software
Japanese Methods for Productivity and Quality
Records Management
Evaluating and Selecting Automated Office Systems
Advanced Micrographics
Digital Geographic Information Systems
Advanced Project Management
Using Computer-Assisted Instruction in Training and Education
Planning and Managing Organizational and Technical Training

Fundamentals of Financial Management
Systems Analysis Techniques for Information Managers
The Technical Manager
Information Resource Management for Engineers
Information Processing Resource Management
Software Project Management
Evaluating Information Processing Systems
Effective Information Systems Planning
Preparation of Technical Proposals for Industry
Preparation of Government Technical Proposals

Materials, Structures, Construction

Advanced Topics in the Finite Element Method
Metal Fracture and Fatigue
Finite Element Method and Computer Graphics in Structural Mechanics
Fibrous Composite Structures
Highway Bridges: Inspecting, Rating, and Upgrading
Railway Bridges: Inspecting, Rating, and Upgrading
Marine Vehicles: Seakeeping and Maneuverability
Recent Advances in Finite Element Technology
Resistance and Propulsion of Ships
Creep Elasticity and Creep Fracture in Solids
Damage Tolerance Analysis of Aircraft Structures
Fluid Power Systems
Welding Engineering
Metal Casting Technology
Industrial Fire Hazards and Control
Hull Form and Stability of Marine Vehicles
Plastics Degradation and Stabilization
Large Structures in Space

Medical Engineering, Health Services

Intensive and Coronary Care Units
Surgical Operating Suites
Clinical Engineering Management
Outpatient and Day-Surgery Center Services
Hospital Emergency Room Services
Neonatal Intensive Care Facilities
Radiology/Imagery Suite Planning and Design
Microcomputers in Medical Instrumentation
Burn ICUs
Carcinogens: Risks and Control Efforts in Engineering Projects

Energy

Heat Pipe Fundamentals and Applications
Protective Relaying and Switchgear Controls
Electrical Equipment Testing and Maintenance
Solar Heating and Cooling
Fluidized-Bed Combustion
Cogeneration Design and Feasibility Analysis
Energy-Efficient Operation and Design of Buildings
Power System Protection
Economics, Rates, and Regulation of Electrical Utilities
Electric Power Systems Design
Forecasting Electricity Demand
Power System Reliability
Application and Control of Electric Motors
Energy Management
Coal Geoscience
Applied Reservoir Engineering
Gas Well Testing and Underground Storage of Natural Gas
Decision Analysis for Petroleum Exploration

Environment

Applied Geodesy
Applied Remote Sensing for Terrain Analysis

Ventilation Design for Industrial Applications
Industrial Solid and Hazardous Waste Incineration

Communications

Modern Data Communications
Electromagnetic Interference and Control
Communications Satellite Engineering
Spread Spectrum Communications Systems
Federal Telecommunications Policy
Fiber and Integrated Optics
Transmission Characteristics of the Switched Telephone Network
Data Communications Systems and Networks
Telephone Equipment Registration
Satellite Systems for Navigation, Traffic Control, and Surveillance
Switched Telephone Networks: Switching Concepts
Fundamentals of Communication Satellite Systems
Digital Transmission Systems Engineering
Wideband Communications Systems
Spectrum Management
Packet Switching for Modern Data Communications
Digital Telephony
Federal Telecommunications Policy
Vulnerability of Spread Spectrum Communications Systems
Synthetic Aperture Radar with Remote Sensing Applications
Grounding, Bonding, and Shielding
Packet Switching Networks and Their Protocols
Synchronization in Spread Spectrum Systems
Magnetic Recording
Telecommunications: Voice and Data
Advanced Cable Technology
Digital Communication Systems
Modern Digital Communications
Standards for Telecommunications and Electronics Products
Military Communications Systems
Elements of Railroad Signaling Systems
Communication Satellite Systems: The Earth Station
A Mission-Oriented Approach to C^3
Tactical Missile Guidance and Control
Satellite Communications
A Tutorial on Digital Communications
Fundamentals of Data Communications
Telecommunications Traffic Engineering
Multi-User Communications Systems and Networks
Digital Television: Bandwidth Reduction
Data Communications Standards
Modern Communications and Signal Processing
Mobile Communications Engineering
Technical Data Management
Digital Communications Applications
Video Teleconferencing
Satellite Communications Systems
Optical Signal Processing
Distributed Telecommunication Networks
Foundations of Modern Telecommunications Systems

New courses are developed as needs become apparent in various fields, and repeated courses are continuously revised. Over 110 new courses were added last year.

In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, from industry, and from government laboratories and agencies serve on the instructional staff of the program.

The program also offers noncredit contract courses off campus specifically tailored for the needs and backgrounds of the engineers employed by a company or agency. Tuition for these courses is usually slightly lower than for those offered at the University.

To receive announcements or additional information on the program, write to Continuing Engineering Education Program, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, or call (202)676-6106 or (800)424-9773.

Administration

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science; Co-director, Joint Institute for Advancement of Flight Sciences; Director, Institute for the Study of Fatigue, Fracture, and Structural Reliability*

James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*

Arthur D. Friedman, Ph.D., *Chairman of the Department of Electrical Engineering and Computer Science*

Charles Matthew Gilmore, Ph.D., *Chairman of the Department of Civil, Mechanical, and Environmental Engineering*

Donald Gross, Ph.D., *Chairman of the Department of Operations Research*

Douglas Linwood Jones, D.Sc., *Mechanical Engineering Curriculum Chairman, Department of Civil, Mechanical, and Environmental Engineering*

Sam Rothman, Ph.D., *Chairman of the Department of Engineering Administration*

Walter Kurt Kahn, D.E.E., *Director, Institute for Information Science and Technology*

William H. Marlow, Ph.D., *Director, Institute for Management Science and Engineering*

Nozer Darabsha Singpurwalla, Ph.D., *Director, Institute for Reliability and Risk Analysis*

Vujica Yevjevich, D.Eng., *Director, International Water Resources Institute*

Malcolm P. Clark, M.S., *Administrator, NASA Langley Graduate Program*

Robert Heath Tolson, M.S., *Chief Scientist, NASA Langley Research Center, Director, Joint Institute for Advancement of Flight Sciences*

John Lindsey Whitesides, Jr., Ph.D., *Assistant Director, Research and Education, Joint Institute for Advancement of Flight Sciences*

Shao Wen Yuan, Ph.D., *Associate Director, Joint Institute for Advancement of Flight Sciences*

George W.M. Brown, M.A., *Manager, Engineering Admissions and Cooperative Education Program*

Graham W. McIntyre, M.S., *Director, Research and Resources Office*

J.W. Perkins, B.S., *Director, Continuing Engineering Education Program*

Dean's Council

Harold Liebowitz *(Chairman)*, R.R. Fox, D. Gross, H. Helgert

Advisory Council*

The purposes of the Advisory Council for the School of Engineering and Applied Science are to strengthen communication between the School and the other colleges, schools, and divisions of the University as well as between the School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the community and the nation; and to stimulate support for the continued development of the School and its programs.

Members of the Council for 1982–83

Chairman: Stephen R. Woodzell *(University Trustee), former President of the Potomac Electric Power Company*
Raymond L. Bisplinghoff, *Director of Research and Development, Tyco Laboratories, Inc.*
Bruno A. Boley, *Dean, Technological Institute, Northwestern University*
George M. Bunker, *Washington, D.C.*
J.P. Chambers, *Vice President, Domestic Customer Relations, E-Systems, Inc.*
L. Stanley Crane, *Chairman and Chief Executive Officer, Consolidated Rail Corporation*
Joseph M. Fox, *Chairman, Software Architecture and Engineering, Inc.*
Moses Freedman, *Vice President, Blake Construction Company*
Eugene G. Fubini, *Engineering Consultant*
Martin Goland, *President, Southwest Research Institute*
William J. Harris, Jr., *Vice President, Research and Test Department, Association of American Railroads*
Alexander Hassan, *Washington, D.C.*
Walter R. Hibbard, Jr., *Professor, Virginia Polytechnic Institute and State University*
William Holt, *Carborundum Company, Niagara Falls, N.Y.*
William H. Marlow, *Professor, Department of Operations Research*
Coleman Raphael, *Chairman and Chief Executive Officer, Atlantic Research Corp.*
Bernard A. Schriever, General USAF (Ret.), *Management Consultant, Schriever & McKee Associates, Inc.*
Wayne G. Shaffer, *Executive Vice President, Automation Industries*
Edward G. Uhl, *Chairman of the Board, Fairchild Industries, Inc.*
Ernst Weber, *President Emeritus, Polytechnic Institute of New York*
Harold A. Wheeler, *Chief Scientist and Chairman Emeritus, Hazeltine Corporation*
L.A. Zadeh, *Professor of Electrical Engineering and Computer Sciences, University of California, Berkeley*

*The President of the University, the Vice President for Academic Affairs, and the Dean of the School of Engineering and Applied Science are *ex officio* members of the Advisory Council.

MTS





Programs of Study and Courses of Instruction

Programs of study, curricula, and courses of instruction offered by the School of Engineering and Applied Science are described in this section.

Students who are not candidates for degrees but who wish to take courses offered by the School should apply for admission to the Division of Continuing Education and Summer Sessions.

Explanation of Course Numbers

Courses numbered 1–199 are planned for undergraduate credit, although certain courses may be taken for graduate credit when arrangements are approved in advance by the instructor and the Dean. Courses numbered 201–300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered 301–400 are primarily for doctoral students.

Semester Hours of Credit

The number of semester hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. A year course giving three hours of credit each semester is marked (3-3) and a semester course giving three hours of credit is marked (3). A semester hour consists of the completion of one 50-minute period of class work or of one laboratory period a week for one semester.

Time of Course Offerings

Following each course description is a parenthetical statement giving the semester for which the course is scheduled to be offered. The term "academic year" is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester; the term "as arranged" is used for courses that could not be scheduled at the time of printing this catalogue. Offerings for the summer sessions are not designated in this catalogue. Students should consult the *Summer Sessions Schedule of Classes* for summer offerings. A *Schedule of Classes* is also published for each fall and spring semester, providing up-to-date information concerning the time of course offerings.

Key to Abbreviations

The following abbreviations for course designations are used by George Washington University.

Acct	Accounting
AdSc	Administrative Science
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
BAd	Business Administration
Bioc	Biochemistry
BiSc	Biological Sciences
Cart	Cartography
CE	Civil Engineering
CH&D	Child Health and Development
Chem	Chemistry
Chin	Chinese
Clas	Classics
CpMd	Computer Medicine
CSci	Computer Science
Derm	Dermatology
EAd	Engineering Administration
Econ	Economics
Educ	Education
EE	Electrical Engineering
EFL	English as a Foreign Language
Engl	English
EnHe	Environmental Health
EngS	Engineering Science
Envr	Environmental Studies
EPol	Education Policy
E&RP	Environmental and Resource Policy
ForS	Forensic Sciences
Fren	French
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
Gnet	Genetics
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
HSA	Health Services Administration
Hmn	Experimental Humanities
Idis	Interdisciplinary Courses
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Kor	Korean
Math	Mathematics
ME	Mechanical Engineering
Med	Medicine
Mgt	Management Science
Micr	Microbiology
M&PA	Medical and Public Affairs
MStd	Museum Studies
Mus	Music
Neur	Neurology
NSur	Neurological Surgery
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
Opth	Ophthalmology
OR	Operations Research
Oral	Oral Biology
Orth	Orthopedic Surgery
PAd	Public Administration
Path	Pathology
Pchi	Psychiatry and Behavioral Sciences
PCm	Political Communications
Phar	Pharmacology
Phil	Philosophy
Phyl	Physiology
Phys	Physics
Port	Portuguese
PSc	Political Science
Psyc	Psychology
Rad	Radiology
Rel	Religion
RPol	Regulatory Policy
RSci	Radiological Sciences
Slav	Slavic Languages and Literatures
SLP	Service Learning Program
Soc	Sociology
Span	Spanish
SpDr	Speech and Drama
SpEd	Special Education
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Policy
Univ	University
Urol	Urology
U&RP	Urban and Regional Planning
WStu	Women's Studies

Applied Science

Interdepartmental offerings.

Undergraduate Courses

57 Analytical Mechanics I (2)
First half of a one-year sequence. Concepts of statics: force systems, equilibrium conditions, simple structures, distributed forces, shear and moments, friction and the concept of work, virtual work and stability. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and Spring)

58 Analytical Mechanics II (3)
Second half of a one-year sequence. Concepts of dynamics: kinematics of particles, velocity and acceleration, Newton's laws of motion, momentum, work, kinetic energy, potential energy, central force fields, vibrations, resonance, dynamics of systems of particles, kinematics of a rigid body, dynamics of a rigid body. Prerequisite: ApSc 57. (Fall and Spring)

113 Engineering Analysis I (3)
Analytical methods appropriate to the solution of engineering problems, applications of ordinary differential equations, matrices and determinants, eigenvalues and eigenvectors, systems of ordinary linear differential equations, Bessel and Legendre functions. Prerequisite or concurrent registration: Math 33. (Fall and Spring)

114 Engineering Analysis II (3)
Analytical methods appropriate to the solution of engineering problems: complex variables, Fourier series and integral, orthogonal functions, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113 (Fall and Spring)

115 Engineering Analysis III (3)
Analytical methods appropriate to the solution of engineering problems using concepts from probability and statistics: random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, regression, and engineering applications. Prerequisite: Math 32. (Fall and Spring)

116 Engineering Analysis IV (3)
Analytical methods appropriate to the solution of engineering problems using advanced concepts from probability and statistics: multivariate distributions, expectation, generating functions, parametric families of distributions, sampling and sufficient statistics, estimation, hypothesis testing, statistical decision theory, and engineering applications. Prerequisite: ApSc 115 and Math 33. (Fall and Spring)

199 Honors Research Project and Seminar (3–3)
Student designs and carries out a research project under close supervision of a faculty adviser. Students from all engineering disciplines meet periodically to present projects and discuss results. Enrollment limited to students admitted to the SEAS Undergraduate Honors Research Program.

Graduate Courses

211 **Analytical Methods in Engineering I (3)**
Engineering applications of the theory of complex variables: contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of Department. (Fall and Spring)

212 **Analytical Methods in Engineering II (3)**
Analytical methods appropriate to the formulation of engineering problems: finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of Department. (Fall)

213 **Analytical Methods in Engineering III (3)**
Analytical techniques for solution of boundary–initial value problems in engineering: wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of Department. (Fall and Spring)

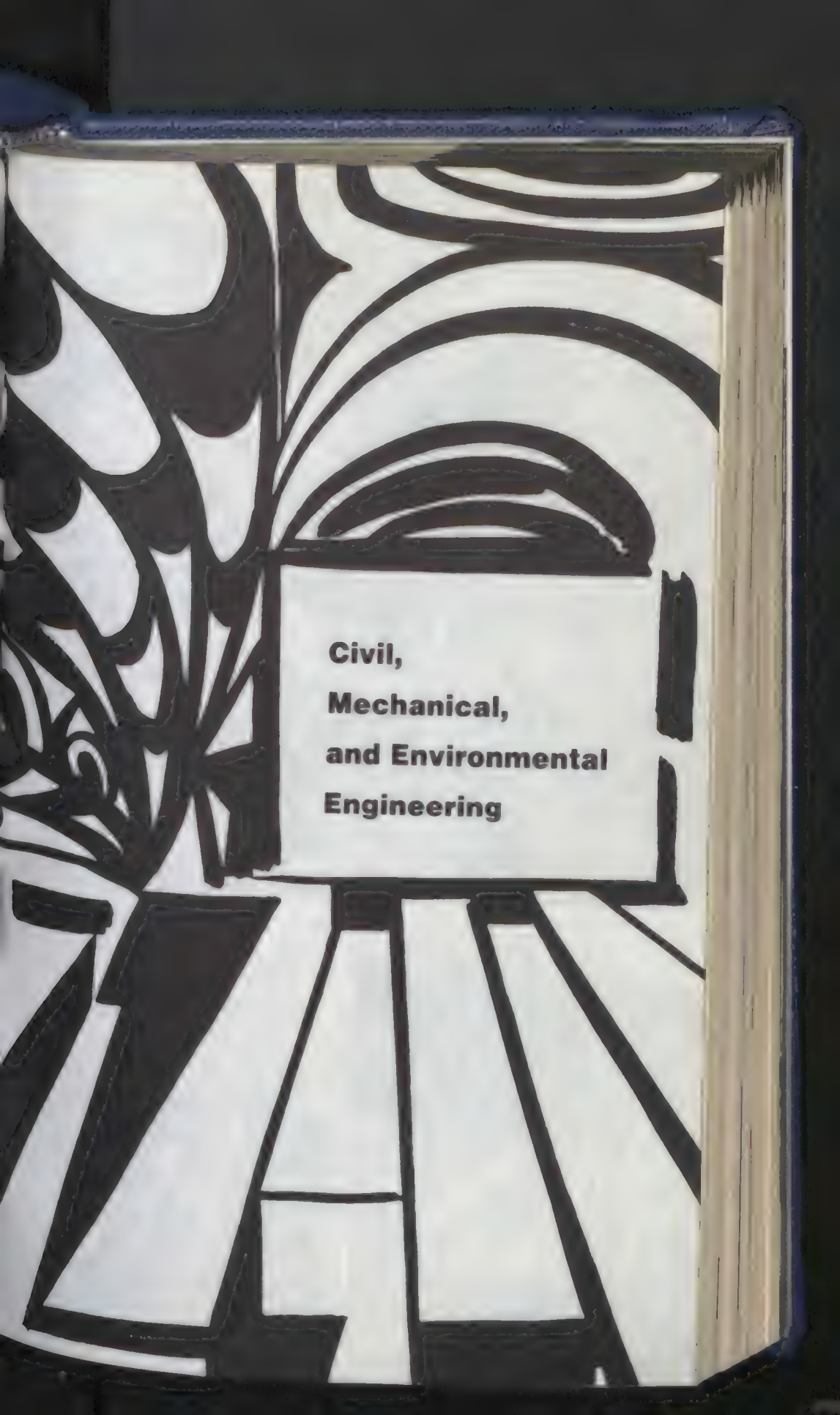
214 **Analytical Methods in Engineering IV (3)**
Introduction to variational methods in engineering: Ritz and Galerkin approximation methods of boundary-value problems, aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of Department. (Spring)

215 **Analytical Methods in Engineering V (3)**
Advanced methods of solution of boundary–initial value problems in engineering: characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall)

216 **Special Topics in Engineering Analysis (3)**
Selected topics such as perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; application of singular integral equations in problems of mechanics; applications of elements of functional analysis in engineering and science. Prerequisite: approval of Department. (Spring, even years)




HOUHOS


Civil,
Mechanical,
and Environmental
Engineering

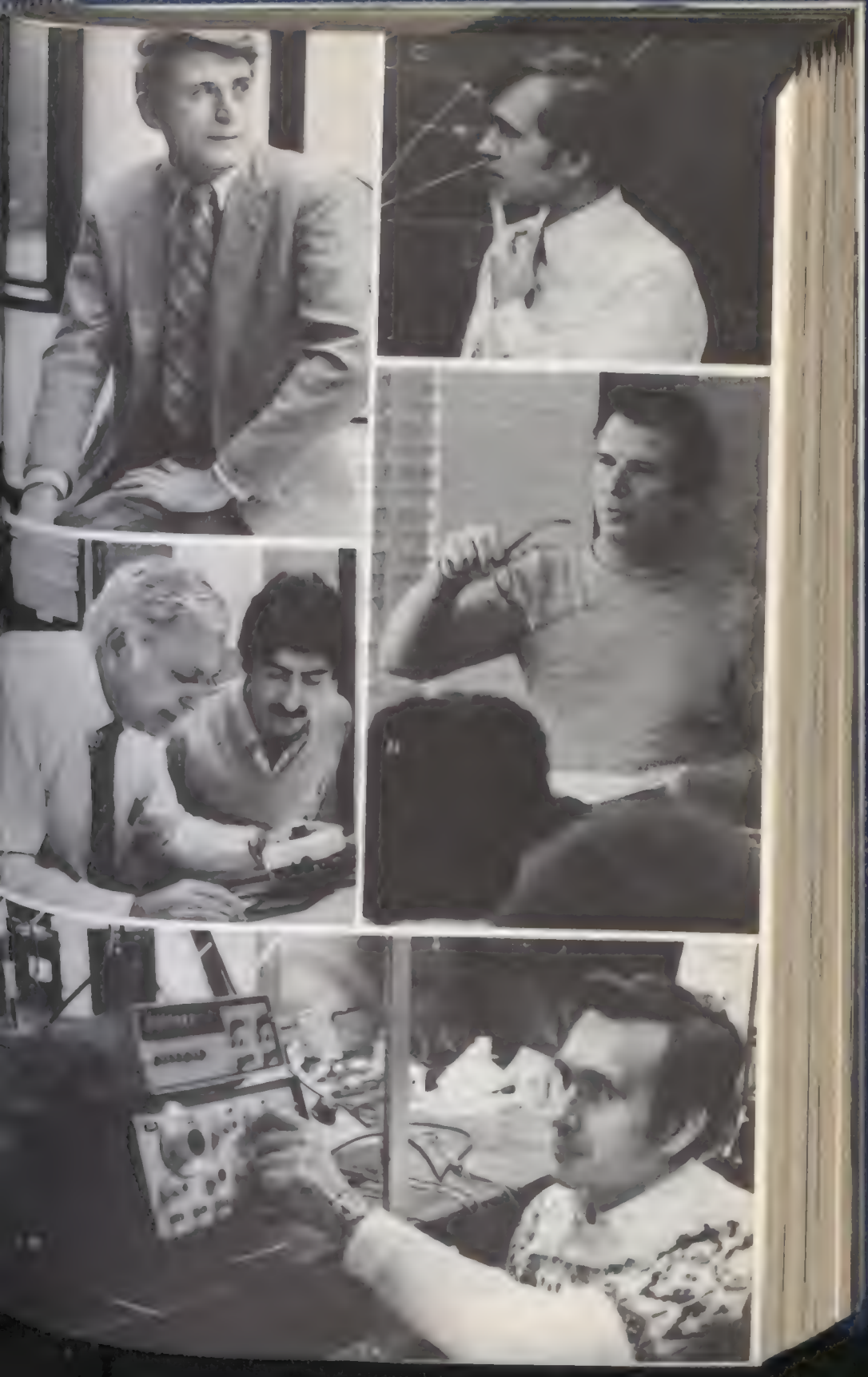












Civil, Mechanical, and Environmental Engineering

Professors G.M. Arkilic, R.R. Fox, H. Liebowitz, S.W. Yuan, J.E. Feir, T.G. Toridis, J.P. Campbell *(Research)*, J. Eftis, A.K. Noor, R. Goulard, A.B. Cambel, K. Mahmood, A.M. Kiper, M.K. Myers, J.-N. Yang, R.E. Kaufman, V. Yevjevich *(Research)*, A. Radkowsky *(Research)*, D.M. Esterling, C.M. Gilmore *(Chairman)*, J.L. Whitesides, Jr., T.P.G. Liverman, V. Klein *(Research)*, D.L. Jones, B.A. Bell

Adjunct Professors W.P. Reid, M.P. Gaus, Y. Gordon, B.W. Hannah

Professorial Lecturers R.E. Fulton, M.J. Queijo, L.K. Loftin, Jr., L. Divone, M. Yachnis, W. Viessman, Jr., K.H. Jones, W.D. Erickson, J.A. Belding, Jr., N.L. Basdekas, B. Whang, M.S. Ojalvo, J.R. Weggel, T.-F. Zien, D.J. Michel, A.K. Kotb, D.R. Levin, G. Banerian, H. Goldsmith, W.L. Harris, W.D. Jackson, H.H. Landon, G.D. Love, B. Miller, S.-C. Liu, C.J. Astill, S. Buckser, W.H. Huang, P.D. Maycock, G.K. Lea, J. Sobieski, J.C. Hardin, D.U. Gubser, E.F. Skelton, R.H. Tolson, D.D. Moran, J.I. Bregman

Associate Professors C.A. Garris, A. Goicoechea *(Research)*, P.K. Poulose *(Research)*

Adjunct Associate Professor A.K. Trehan

Associate Professorial Lecturers R.W. Fralich, E.C. Yates, Jr., M. Stein, R.W. Barnwell, T.M. Walsh, H.A. Leybold, P.L. Coe, Jr., C.J. Jachimowski, M.C. Cullingford, D. Feit, R. McConnell, D.R. Tenney, A.M. Yen, J.C. Yu, R.Y. Ting, A. Kehnemui, E.R. Long, Jr., H.S. Gill, W. Kenis, S.K. Park, D.W. Ellison, P. Boon, R.M. Brown, M.O. Critchfield, C. Ng, F.L. Willingham, Jr., F. Farassat, S.T. Hwang, S.C. Mehrotra, M.S. Nataraja, L.-S. Pan, A.B. Wardlaw, Jr., C. Wu, K. Khozeimeh, R.S. Polvani, R.L. Bowles, B.R. Barkstrom, V. Mukhopadhyay, W.J. Boettinger, D.W. Coder, W.D. Burrows, M.M. Mikulas, Jr., L.D. Pinson, J.C. Coolbaugh, C. Winklehaus

Assistant Professor R.K. Kurzeja *(Research)*

Assistant Professorial Lecturers H.L. Beach, Jr., D.D. Loendorf, G.D. Walberg, B.A. Stein, M.J. Furman, R. Lee, T.L. Walton, Jr., J.N. Shoosmith, G.E. Hicho, M.Y. Hussaini, R.C. Swanson, Jr., M.F. Card, K. Sutton, L.W. Townsend, J.N. Moss, D.L. Dwoyer, D.R. Mulville, J.F. O'Dea, E.E. Zarnick, M.B. Wilson, M.A. Imam

Lecturer P.G. Chesler

Civil Engineering—Undergraduate Study

Civil engineering encompasses those branches of engineering activities most closely related to the control and improvement of our environment and of the conditions of life. Study in this field prepares students for careers in the planning, design, and construction of: buildings; bridges; roads; airports; rapid transportation systems; harbors; off-shore facilities; coastal protection structures; flood and pollution control systems for rivers, estuaries, and lakes; inland navigation systems; large power generation and flood control dams; water resources projects; urban renewal and development projects; and pollution control and waste disposal projects. It also provides the scientific and technological background required for careers in municipal engineering,

urban and regional planning, and environmental and geotechnical civil engineering and for careers in engineering research in structural mechanics, ocean engineering, and materials engineering.

The curriculum provides the essentials for beginning a career upon graduation, for registration as a professional civil engineer as required by law, and for continuing study at the graduate level.

Part-Time Study

In response to requests from individuals employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Civil Engineering in a reasonable period of time, evening or late afternoon classes in the Civil Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

CSci 51: Applications of Computers (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

EngS 4: Descriptive Geometry and Drafting (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Chem 13: General Chemistry (4)
Elective: Selected from humanities or social sciences (3)

Third Semester

Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

Phys 16: Modern Physics (3)
ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 120: Introduction to the Mechanics of Solids (3)
CE 140: Materials Science (3)

Civil Engineering Curriculum

Fifth Semester

CE 121: Structural Theory I (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 126: Fluid Mechanics (3)
ME 131: Thermodynamics (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CE 122: Structural Theory II (3)
CE 192: Reinforced Concrete Structures (3)
CE 193: Hydraulics (3)
Geol 136: Engineering Geology (3)
Elective: Selected from humanities or social sciences (6)

Seventh Semester

CE 168: Introductory Soil Mechanics (3)
CE 190: Contracts and Specifications (2)
CE 191: Metal Structures (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
CE 195: Hydrology (3)
Elective: Technical elective (3)

Eighth Semester

CE 182: Foundation Engineering (2)
CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)
CE 196: Design and Cost Analysis of Civil Engineering Structures (3)
CE 197: Environmental Engineering II: Waste and Pollution Control (3)
Elective: Technical Electives* (8)

Technical Electives

ApSc 199: Honors Research Project and Seminar (3–3)
CE 198: Research (3)
CE 201: Design of Metal Structures (3)
CE 202: Design of Reinforced Concrete Structures (3)
CE 203: Prestressed Concrete Structures (3)
CE 204: Applied Soil Mechanics I (3)
CE 206: Foundation Engineering (3)
CE 208: Rock Engineering (3)
CE 210: Methods of Structural Analysis (3)
CE 212: Open Channel Flow (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)

*EAd 160 *Introduction to Engineering Economic Analysis* is a strongly recommended technical elective.

CE 220: **Urban Transportation Engineering** (3)
CE 222: **Stations and Terminals** (3)
CE 223: **Traffic Engineering** (3)
CE 240: **Environmental Microbiology** (3)
CE 241: **Environmental Chemistry** (3)
CE 243: **Environmental Impact Assessment** (3)
CD 253. Failure and Reliability Analysis of Engineering Structures (3)
CE 255: **Coastal Processes** (3)
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I (3)
CE 282: **Hydraulic Modeling** (3)
EAd 160: Introduction to Engineering Economic Analysis (3)*
EngS 215. Advanced Strength of Materials (3)
EngS 229: **Transformations in Materials** (3)
EngS 230. Deformation of Materials (3)
EngS 231: **Structure of Materials** (3)
EngS 234: **Composite Materials** (3)
EngS 237: **Environmental Effects on Materials** (3)
EngS 241: **Failure of Materials** (3)
EngS 242: Materials Recycling and Recovery (3)
EngS 282: Computer-Aided Design (3)
EngS 284: Numerical Methods in Engineering (3)

Civil Engineering Undergraduate Courses

120 **Introduction to the Mechanics of Solids** (3)
Stress and strain; axial load problems; torsion; shear force and bending moment; pure bending of beams, shearing stresses in beams; compound stresses, analysis of plane stress and plane strain; combined stresses; deflection of beams, statically indeterminate problems; columns; the energy methods. Prerequisite: ApSc 57, 113. (Fall and Spring)

121–22 **Structural Theory I–II** (3–3)
Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall and Spring)

140 **Materials Science** (3)
Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; phase transformations, mechanical properties, electrical conduction; metals, insulators, semiconductors, magnetism; optical properties. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and Spring)

166 **Materials Engineering** (2)
Mechanical properties, plastic deformation dislocation theory, yielding, strengthening mechanisms, microstructure and properties, heat treatment of steel, composites, amorphous materials, visco-elastic deformation, creep, fracture, fatigue, fatigue crack propagation. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and Spring)

167 **Mechanics of Materials Laboratory** (1)
Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact, and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and Spring)

168 **Introductory Soil Mechanics** (3)
Engineering properties of soils; analysis of lateral earth pressures, bearing

*Strongly recommended technical elective.

capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

182 **Foundation Engineering** (2)
Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures, professional ethics applications. Prerequisite: CE 168. (Spring)

185 **Soil Mechanics and Foundation Engineering Laboratory** (1)
Laboratory experiments for the classification, strength, compressibility, and general engineering properties of soils. Prerequisite: CE 168. (Spring)

190 **Contracts and Specifications** (2)
Law of contracts; construction contracts; specifications; bidding; insurance and bonds; professional liability, arbitration of disputes, litigation. (Spring)

191 **Metal Structures** (3)
Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction; professionalism in design. Prerequisite: CE 122. (Fall)

192 **Reinforced Concrete Structures** (3)
Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121; or concurrent registration: CE 122. (Spring)

193 **Hydraulics** (3)
Fluid statics: applications to calculation of boundary forces in a static fluid, buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open channel flow: applications to water resources engineering. Prerequisite: ME 126. (Fall)

194 **Environmental Engineering I: Water Supply and Resources** (3)
Planning and design of water supply and waste-water disposal systems. Water quality control and treatment processes. Desalination, stream pollution control. Prerequisite or concurrent registration: CE 193. (Fall)

195 **Hydrology** (3)
Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin outflow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)

196 **Design and Cost Analysis of Civil Engineering Structures** (3)
Total structural systems concepts. Design of civil engineering structures such as piers, wharves, bulkheads, offshore platforms, dams, and other special structures. Principles of cost analysis for timber, steel, and reinforced concrete structures. Prerequisite: senior status. (Spring)

197 **Environmental Engineering II: Waste and Pollution Control** (3)
Disposal of sewage, biological treatment, chemical treatment, filtration, activated sludge, sludge handling and disposal. Control of industrial wastes and of nuclear waste products. Solid waste disposal. Prerequisite: CE 193. (Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Mechanical Engineering—Undergraduate Study

Mechanical engineering is primarily concerned with physical systems in motion. A mechanical engineer is concerned with the conversion, transfer, and control of energy from its source to its moving system. Land and marine vehicles, transportation systems, air-conditioning systems, nuclear reactors and fuel cells, low-pollution control devices, synthetic fuels, energy resources and the means of practical and economical conversion of the various forms of energy to mechanical and electrical power, and a host of other devices lie in this domain. Training in this area should provide the ability to formulate problems based on fundamental laws of nature, to recognize the types of methods applicable to their solution, to read with understanding the relevant work, and to come up with a usable answer. The mechanical engineering curriculum provides a background for careers in research, design, development, and manufacturing in a wide variety of industries.

Course offerings in mechanical engineering, which begin with a broad foundation in physics, chemistry, mathematics, humanities, and social sciences, consist of studies in basic mechanics of solids and fluids, electricity and electronics, materials sciences, dynamic analysis, thermal sciences, energy conversion and power, environmental control, and the design of machines and systems and their control. Because of the increasing emphasis on the application of computers in mechanical engineering, the curriculum incorporates computer applications in a wide variety of courses. These applications include computer-aided drafting, analysis of mechanical system components, optimization of mechanical engineering systems, and laboratory data collection and reduction. Technical electives in the senior year permit students to select an option from a broad range of specialty areas. These areas include combustion and environmental engineering, computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering.

The program outlined below is based on the concept that the mechanical engineer must be prepared to meet the challenge of ever-increasing technical economic and social problems. Graduates of the mechanical engineering curriculum are qualified for professional positions in analysis, research and development, computer-aided design, and manufacturing and for graduate study and research in a wide variety of fields.

Part-Time Study

In response to requests from individuals employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Mechanical Engineering in a reasonable period of time, late afternoon and evening classes in the Mechanical Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Junior Year Abroad Program

The School of Engineering and Applied Science and the Institute of Sound and Vibration Research of the University of Southampton, England, have established an exchange program so that graduate students in acoustics at both institutions may transfer academic credits to either University in fulfillment

of the requirements for advanced degrees. A special arrangement has now been made to extend the graduate exchange program to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad.

The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general and international technical fields in particular.

Applicants must apply for admission to the Junior Year Abroad Program to the Department Chairman before the end of the fall semester of the sophomore year. Approval must be given by the Department Chairman and the Dean of the School of Engineering and Applied Science.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

Math 31: Single-Variable Calculus I (3)*
CSci 51: Applications of Computers (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

Math 32: Single-Variable Calculus II (3)
EngS 4: Descriptive Geometry and Drafting (3)
Phys 14: Mechanics and Thermal Physics (3)
Chem 13: General Chemistry (4)
Elective: Selected from humanities or social sciences (3)

Third Semester

Math 33: Multivariable Calculus (3)
ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
Phys 16: Modern Physics (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Elective: Selected from humanities or social sciences (3)

*Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test may be required to pass Math 3, 6, or 30 as deficiency courses.

Mechanical Engineering Curriculum

Fifth Semester

CE 120: Introduction to the Mechanics of Solids (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 117: Mechanical Engineering Computations (3)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)

Sixth Semester

EE 20: Introductory Engineering Electronics (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics (3)
ME 148: Thermodynamic Systems (3)
ME 191: Mechanical Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

ME 187: Heat Transfer Theory (3)
ME 190: Analysis and Synthesis of Mechanisms (3)
ME 193: Engineering Systems Design I (3)
Elective: Technical electives (6)

Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 182: Electromechanical Control System Design (3)
ME 195: Engineering Systems Design II (2)
ME 196: Design Project (1)
Elective: Selected from humanities or social sciences (3)
Elective: Technical electives (6)

Mechanical Engineering Options

In all option areas a minimum of 12 semester hours of technical electives must be taken from one of the following options. Alternative elective programs or individual course substitutions may be approved upon written request by the student to his or her adviser and the department.

Combustion and Environmental Engineering

ApSc 199: Honors Research Project and Seminar (3–3)
*ME 155: Compressible Fluid Flow (3)
ME 198: Research (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 224: Fundamentals of Combustion Engines (3)

*Required technical elective for the option indicated.

ME 237: Energetics of Fluid Flow I (3)
*ME 261: Air Pollution I (3)
ME 262: Air Pollution II (3)
ME 267: Power Plant Pollution Control (3)
ME 293: Combustion (3)

Computer-Aided Design

ApSc 199: Honors Research Project and Seminar (3–3)
CSci 150: Introduction to Microcomputers (3)
CSci 153: Design of Switching Systems (3)
CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods (3)
EngS 282: Computer-Aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
*ME 192: Product Design and Process Engineering (3)
ME 198: Research (3)

Energy and Power

ApSc 199: Honors Research Project and Seminar (3–3)
EngS 208: Energy Conservation (3)
*ME 155: Compressible Fluid Flow (3)
ME 198: Research (3)
ME 257: Energy Technology I (3)
ME 258: Energy Technology II (3)
ME 259: Solar Heating of Buildings (3)
ME 260: Heating and Air Conditioning of Buildings (3)
ME 291: Power Systems I (3)
ME 292: Power Systems II (3)

Fluid Mechanics and Thermal Sciences

ApSc 199: Honors Research Project and Seminar (3–3)
EngS 218: Introduction to Continuum Mechanics (3)
*ME 155: Compressible Fluid Flow (3)
ME 198: Research (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 231: Hydrodynamics (3)
ME 237: Energetics of Fluid Flow I (3)
ME 280: Intermediate Thermodynamics (3)
ME 288: Convective Heat and Mass Transfer (3)
ME 289: Radiative Heat Transfer (3)

Mechanical Engineering Design

ApSc 199: Honors Research Project and Seminar (3–3)
EngS 215: Advanced Strength of Materials (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285 Finite Element Methods in Engineering Mechanics (3)
*ME 192: Product Design and Process Engineering (3)

*Required technical elective for the option indicated.

ME 198: Research (3)
ME 215: Theory of Vibrations (3)
ME 240: Kinematic Synthesis (3)
ME 241: Engineering Systems Design (3)
ME 242: Advanced Mechanisms (3)
ME 243: Advanced Mechanical Engineering Design (3)

Solid Mechanics and Materials Engineering

ApSc 199: Honors Research Project and Seminar (3–3)
EngS 215: Advanced Strength of Materials (3)
*EngS 218: Introduction to Continuum Mechanics (3)
EngS 221: Theory of Elasticity I (3)
EngS 231: Structure of Materials (3)
EngS 233: Mechanics of Composite Materials (3)
EngS 234: Composite Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
ME 198: Research (3)
Phys 170: Elementary Solid State Physics (3)

Mechanical Engineering Undergraduate Courses

117 **Mechanical Engineering Computations** (3)
Application of numerical methods to the solution of mechanical engineering problems. Reduction of physical and engineering systems to computer models. Optimization techniques, physical modeling, numerical methods, and problem solving techniques. Emphasis on use of small-scale computing systems. Prerequisite: CSci 51 and junior status. (Fall)

120 **Methods of Engineering Experimentation** (2)
Acquisition and analysis of experimental data. Laws of modeling and simulation. Report formulation and presentation. Basic principles of measuring instruments and sensors. Fundamentals of digital data acquisition and use of computer-based data systems. Laboratory experiments including the use of strain gages, oscilloscopes, transducers, and computerized data systems. Prerequisite: ME 117. (Spring)

126 **Fluid Mechanics** (3)
Fluid properties, fluid statics, integral and differential formulations of conservation of mass, momentum, and energy. Bernoulli's equation. Dimensional analysis and similitude. Inviscid flow. Viscous flow. Application of computers in fluid mechanics. Prerequisite: ApSc 58. (Spring)

131 **Thermodynamics** (3)
Fundamental thermodynamic concepts. Zeroth law of thermodynamics and temperature measurements, work and heat, first law of thermodynamics, properties of pure substances, first-law analysis of some thermodynamic systems, second law of thermodynamics, reversibility, entropy, second-law analysis of thermodynamic systems. Prerequisite or concurrent registration: ApSc 58. (Fall)

134 **Introduction to Vibration Analysis** (3)
Natural frequencies, free vibration, forced vibration. Unbalance, whirling, vibration isolation. Measuring techniques and application of computers in vibration analysis. Multiple degrees of freedom. Dynamic vibration absorbers. Shock and transient vibration. Prerequisite: ApSc 58. (Fall)

*Required technical elective for the option indicated

148 **Thermodynamic Systems** (3)
Second-law analysis of thermodynamic systems. Mixtures of gases and vapors, properties of air–water vapor mixtures, psychrometry and its application in some engineering processes. Power from two-phase systems, Rankine cycle and engine, improving the thermal efficiency of Rankine engines, reheat and regeneration. Gas turbine, Brayton and regenerative cycles. Internal combustion engines, Otto and Diesel cycles. Thermodynamic analysis of reactive systems. Prerequisite: ME 131. (Spring)

152 **Mechanical Engineering Laboratory** (2)
Major project-oriented course—simulates working environment of graduate engineers. Projects are assigned in student's areas of interest, student is expected to design and assemble own experiments. Extensive use of instrumentation and computing facilities. Project proposal, progress reports, final report, and periodic oral presentations required. Prerequisite: ME 120. (Spring)

155 **Compressible Fluid Flow** (3)
Introduction to internal and external compressible fluid flows. Acoustic velocity and Mach number. Isentropic flow relations with isotropic fluid properties. Flow in nozzles and around turbine wheels and airfoils. Normal and oblique shock phenomena. Diabatic flow, i.e., with heat addition, or Rayleigh flow. Flow with friction or Fanno flow. Computer approaches to nozzle and or wing design. Prerequisite: ME 126 and ME 131. (Fall)

182 **Electromechanical Control System Design** (3)
Application of control theory to the design of electromechanical systems. Characteristics of transducers, valves, and other control components. Mathematical models of open- and closed-loop electromechanical systems. Root locus and frequency response methods, application to the synthesis of feedback systems by both manual and computer-aided techniques. Prerequisite: ApSc 114; ME 117, 134. (Spring)

187 **Heat Transfer Theory** (3)
Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective heat transfer. Evaluation of convective heat transfer coefficients, dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative heat transfer between surfaces. Design considerations, heat-exchanger design and selection. Prerequisite: senior status. (Fall)

190 **Analysis and Synthesis of Mechanisms** (3)
Kinematics and dynamics of mechanisms. Displacements, velocities, and accelerations in linkage, cam, and gear systems by analytical, graphical, and computer methods. Synthesis of linkages to meet prescribed performance requirements. Prerequisite: ApSc 58. (Fall)

191 **Mechanical Design** (3)
Integration of knowledge of strength of materials in a design context. Stresses and deflections in engineering structures. Theories of failure. Introduction to the design of mechanical components, such as fasteners, shafts, springs. Introduction to the use of computers in mechanical engineering design. Prerequisite: CE 120, ME 117. (Spring)

192 **Product Design and Process Engineering** (3)
Introduction to product design and modern manufacturing techniques. Functional, technological, and economic considerations, such as production volume, energy and materials consumption, and labor. Criteria for product acceptance, cost, and other factors. Properties and behavior of metals and polymers. Capabilities and limitations of various basic and secondary processes, influence on product design. Computer-aided manufacturing and flexible manufacturing systems. Prerequisite: junior status. (Spring)

193 **Engineering Systems Design I** (3)
Creative engineering design, problem definition, and concept generation. Design of and familiarization with bearings, clutches, brakes, and couplings. Optimization of system design using computers and design projects. Graphical communication, project presentation, and use of existing design resources. Prerequisite: ME 191. (Fall)

194 **Energy Conversion** (3)
Energy sources and utilization, principal fuels for energy conversion. Production of thermal energy, conversion of chemical energy, fossil fuel systems. Energy conservation and environmental considerations in energy conversion and use. Production of electrical energy, fundamental principles, technological options, longer range possibilities. Energy management and economical considerations. Prerequisite: EE 20, ME 148. (Spring)

195 **Engineering Systems Design II** (2)
Design of systems involving a large variety of constraints and requiring ingenuity and application of principles from thermal systems, heat transfer, fluid mechanics, and mechanical components. Consideration of economic, safety, and reliability factors in the final design. Prerequisite: ME 193; concurrent registration: ME 196. (Spring)

196 **Design Project** (1)
Identification and preparation of a design project, including problem formulation, feasibility studies and preliminary design, prototype development and testing, and design optimization. Concurrent registration: ME 195. (Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Engineering Science—Undergraduate Course

4 **Descriptive Geometry and Drafting** (3)
Introductory descriptive geometry. Use of equipment. Points, lines, curves, planes, and surfaces, principal, auxiliary, and orthographic views, isometric views, intersection of surfaces. Technical sketching, dimensions and precision, machine elements. Detail and assembly drawings. Introduction to computer-aided drafting. (Fall and Spring)

Graduate Study

Developments in science and technology in the decades to come will require the engineer to be thoroughly grounded in fundamentals as well as in the newly emerging technological and scientific disciplines. The modern engineer must also master techniques in analysis, computation, design, and synthesis. Amid the proliferation of knowledge and technological specialty, the Department adheres to the principle that versatility and depth in scientific fundamentals should be the characteristic features of any graduate program that attempts to prepare the student to cope with engineering developments.

The Department of Civil, Mechanical, and Environmental Engineering offers graduate programs in various areas of concentration, leading to the Master of Science, the professional, and the Doctor of Science degrees.

The Doctor of Science degree is offered in the following areas: acoustics; aeronautics; energy; environmental engineering; fluid mechanics and thermal sciences; ocean, coastal, and marine engineering; solid mechanics and materi-

als engineering; structural engineering; structures and dynamics; transportation engineering; and water resources (except Option 2, water resources planning, which is for the M.S. degree only).

The Master of Science and the professional degrees are offered in all of the aforementioned areas and in the following areas: computer-aided design, environmental modeling (M.S. degree only), geotechnical engineering, mechanical engineering design, and public works engineering.

Courses for these specializations are listed on the following pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science and from other schools and divisions of the University. Depending on the interest of the student, some of the programs leading to the Master of Science and, by special permission of the appropriate department chairman, Doctor of Science degrees are given at the NASA–Langley Research Center, Hampton, Virginia. NASA–Langley's extensive scientific and engineering facilities and equipment are used whenever feasible.

Each program is arranged to fit the student's individual needs and interests and to use previous experience and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests, enabling a close student–faculty relationship to develop during the course of the program.

Language Requirement for Doctoral Program

No foreign language is required for the Doctor of Science degree program. A proficiency in one computer programming language, however, must be demonstrated to the doctoral adviser.

Fields and Areas of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas. In this section, an asterisk indicates that a course or program is offered at NASA–Langley Research Center but may be offered on campus when arranged.

*Acoustics**

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
*EngS 203–4: Probability and Statistics of Metrology
EngS 217: Analytical Mechanics
EngS 270: Theoretical Acoustics I
*EngS 271: Random Process Theory I
*EngS 272: Random Process Theory II
*EngS 273: Time Series Analysis
EngS 274: Environmental Noise Control
*EngS 275: Theoretical Acoustics II
*EngS 276: Acoustical and Mechanical Measurements
*EngS 277: Physical Acoustics
*EngS 278: Psychological and Physiological Acoustics

*EngS 279: Human Factors in Engineering
*EngS 280: Special Topics in Acoustics
EngS 298: Research
EngS 299–300: Thesis Research
*EngS 310: Aeroacoustics
*EngS 311: Nonlinear Acoustics
*EngS 312: Theory of Random Vibration
*EngS 313: Structural Acoustics Interaction
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for MS degree: ApSc 211, 213; EngS 270, 274 or 276; ME 215, 221.

*Aeronautics**

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EE 202: Linear System Theory I
EngS 217: Analytical Mechanics
EngS 284: Numerical Methods in Engineering
ME 215: Theory of Vibrations
ME 211: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
*ME 248: Seminar: Aircraft Design I
*ME 249: Seminar: Aircraft Design II
*ME 270: Aerodynamics of Flight Vehicles
*ME 271: VTOL Aircraft Technology
*ME 272: Powered-Lift Technology
*ME 273: Principles of Automatic Flight Control
*ME 274: Principles of Flight Guidance
ME 275: Stability and Control of Vehicles
ME 277: Numerical Methods in Viscous Flow
*ME 279: Special Topics in Flight Sciences
ME 281: Nonequilibrium Thermodynamics
*ME 290: Kinetic Theory of Gases
ME 295: Statistical Thermodynamics
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 315: Hypersonic Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for MS degree: ApSc 211, 213; ME 221, 275.

Computer-Aided Design

ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 210: Methods of Structural Analysis
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 262: Design of Plates and Shell Structures
CE 263: Theory of Structural Stability
CSci 158: Algorithmic Methods
CSci 201: Introduction to Computer Systems
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
CSci 227: Management Information Systems and Database Management
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems

Required courses for MS degree: ApSc 213; CSci 159, 201, 213; EngS 282; CSci 219 or EngS 283.

Energy

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
CE 243: Environmental Impact Assessment
EAd 221–22: Environmental Management
EAd 283: Systems Engineering I
EngS 206: Technology and Human Needs
EngS 207: Engineering Climatology
EngS 208: Energy Conservation
EngS 210: Quantitative Aspects of Social Phenomena
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 242: Materials Recycling and Recovery
EngS 270: Theoretical Acoustics I
EngS 274: Environmental Noise Control
EngS 284: Numerical Methods in Engineering

ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
ME 257: Energy Technology I
ME 258: Energy Technology II
ME 259: Solar Heating of Buildings
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 264: Air Pollution Seminar
ME 267: Power Plant Pollution Control
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 283: Nuclear Reactor Engineering I
ME 284: Nuclear Reactor Engineering II
ME 287: Heat Conduction
ME 290: Kinetic Theory of Gases
ME 291–92: Power Systems
ME 293: Combustion
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research
OR 201: Survey of Operations Research Methods

Required courses for degree programs* in energy technology (Option 1): MS[3,5]—ApSc 211, 213, ME 221, 257, 258, 280, 288. Professional degree—competency in above and ES 284, ME 291, 292, 298 (6). DSc[5]—competency in above and ApSc 212, 215.

Required courses for degree programs* in energy systems (Option 2): MS[4]—EngS 284; ME 257, 258, 261; OR 201. Applied Scientist—competency in above and ME 298 (6). DSc—competency in above and requirements to be made by doctoral advisory committee to benefit the student's intellectual/professional aspirations.

Environmental Engineering

Option 1: Water and Wastewater Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 211: Physical Chemical Wastewater Treatment
CE 212: Open Channel Flow

*All students are expected to have competency in computer literacy. Those who have no such competence are encouraged to take CSci 100 (for non-EE CSci students), which may be taken for graduate credit upon the approval of the faculty adviser.
†Students without research experience are encouraged to pursue the thesis option.
‡Students presenting themselves for comprehensive and/or qualifying examinations are encouraged to be appreciative of the contents of EngS 218 and ME 237.

CE 213: Hydraulic Structures
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 237: Advanced Sanity Engineering Design
CE 240: Environmental Microbiology
CE 241: Environmental Chemistry
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 272: Biological Wastewater Treatment
CE 273: Water Supply Engineering
CE 276: Water Resources Planning and Control
CE 277: Industrial Waste Treatment
CE 278: Pollutant Transport
CE 279: Unit Operations in Environmental Engineering
CE 280: Water Resources Systems
CE 283: Special Topics in Environmental Engineering
CE 298: Research
CE 299 300: Thesis Research
EngS 242: Materials Recycling and Recovery
ME 221: Intermediate Fluid Mechanics
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 263: Air Pollution Control Technology

Required courses for MS degree: CE 211, 212, 240, 241, 272, 273.

Required courses for DSc degree: ApSc 211, 213; CE 279.

Option 2: Air Pollution Engineering

ApSc 211: Analytical Methods in Engineering I
or
EngS 284: Numerical Methods in Engineering
ApSc 213: Analytical Methods in Engineering III
CE 211: Physical Chemical Wastewater Treatment
CE 240: Environmental Microbiology
CE 241: Environmental Chemistry
CE 272: Biological Wastewater Treatment
EAd 221–22: Environmental Management
EngS 207: Engineering Climatology
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 270: Theoretical Acoustics
EngS 274: Environmental Noise Control
ME 204: Advanced Instrumentation Techniques
ME 215: Theory of Vibrations
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engineering
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 257–58: Energy Technology
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 264: Air Pollution Seminar
ME 267: Power Plant Pollution Control
ME 282: Fossil Fuels
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 291–92: Power Systems

ME 293: Combustion
ME 312: Theory of Turbulence

Required courses for MS degree: ApSc 211 or EngS 284; ApSc 213, ME 221, 261, 262, 267, 288.

Environmental Modeling*

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
*EngS 263: Atmospheric Physics for Engineers I
*EngS 264: Atmospheric Physics for Engineers II
EngS 284: Numerical Methods in Engineering
EngS 298: Research
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 257: Energy Technology I
ME 285: Reaction Kinetics
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 296: Special Topics in Heat and Mass Transfer
ME 312: Theory of Turbulence

Required courses for MS degree: ApSc 211, 213; EngS 263, 264

Fluid Mechanics and Thermal Sciences

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 274: Mechanics of Water Waves
EE 133: Electromagnetic Waves and Microwave System Design
EE 236: Plasma Dynamics
EngS 218: Introduction to Continuum Mechanics
EngS 284: Numerical Methods in Engineering
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 261: Air Pollution I
ME 277: Numerical Methods in Viscous Flow
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics

ME 287: Heat Conduction
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 293: Combustion
ME 295: Statistical Thermodynamics
ME 297: Special Topics in Fluid Mechanics
ME 298: Research
ME 299–300: Thesis Research
ME 310: Mechanics of Non-Newtonian Fluids
ME 311: Nonsteady Flow
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 315: Hypersonic Flow
ME 317: Physical Gas Dynamics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for MS degree: ApSc 211, 213; ME 221, 280 (also ME 227 for nonthesis students). For professional and DSc degrees: Fluid Mechanics—ApSc 212 or 214 or 216, 215; ME 231, 288, 311, 312; Thermal Sciences—ApSc 212 or 214 or 216, 215; ME 235, 287, 288, 289.

Geotechnical Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 210: Methods of Structural Analysis
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 219: Groundwater and Seepage
CE 221: Pavement and Runway Design
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 265: Special Topics in Geotechnical Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 256: Introduction to the Theories of Inelastic Media
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

†Geol 128: Geomorphology
†Geol 189: Geophysics for Geologists
†Geol 224: Advanced Structural Geology

Required courses for MS degree: ApSc 211 or 213; CE 204, 205, 206; EngS 285.
For professional degree: CE 207, 208, 209, 219; EngS 221.

Mechanical Engineering Design

ApSc 213: Analytical Methods in Engineering III
CE 253: Failure and Reliability Analysis of Engineering Structures
EngS 215: Advanced Strength of Materials
EngS 259: Random Vibrations of Structures
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 298: Research
ME 299–300: Thesis Research

Required courses for MS degree: ApSc 213 or EngS 284; ME 241, 243, 246.

Ocean, Coastal, and Marine Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 203: Prestressed Concrete Structures
CE 206: Foundation Engineering
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 265: Special Topics in Geotechnical Engineering
CE 274: Mechanics of Water Waves

†For course description, see the *Undergraduate and Graduate Programs Bulletin*.

CE 275: Special Topics in Ocean Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 228: Physical Oceanography
EngS 260: Random Process Theory in Engineering
EngS 273: Time Series Analysis
†Geol 181: General Oceanography
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 297: Special Topics in Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for degree programs in hydromechanics: MS—ApSc 211, 213; EngS 260; ME 221. DSc—ApSc 212, 214, 215; CE 274; ME 227, 231, 312.

Required courses for degree programs in ocean, coastal, and marine engineering: MS—ApSc 211, 213; EngS 260; ME 221. DSc—ApSc 212, 215; CE 256, 274; ME 231, ME 215 or EngS 273.

Public Works and Transportation Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 210: Methods of Structural Analysis
CE 211: Physical and Chemical Wastewater Treatment
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 215: Urban Construction Technology
CE 216: Advanced Hydrology
CE 217: Water Resources Engineering
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 223: Traffic Engineering
CE 237: Advanced Sanitary Engineering Design
CE 242: Solid Waste Disposal

†For course description, see the *Undergraduate and Graduate Programs Bulletin*

CE 243: Environmental Impact Assessment
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 276: Water Resources Planning and Control
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 399: Dissertation Research
EAd 204: Administration of Engineering Contracts
EAd 210: Engineering Law
EAd 241: Construction Management I
EAd 242: Construction Management II
EAd 243: Construction Management III
EAd 261: Economic Analysis in Engineering Planning
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 251–52: Transportation Workshop
EngS 253: Control of Automated Transit Networks
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
ME 255–56: Urban Transportation Technology
OR 201: Survey of Operations Research Methods
OR 231: Theory of Traffic Flow
†U&RP 208: Urban Transportation Planning
†U&RP 209: Urban Transportation Models

Public Works Option:
Required courses for MS degree: CE 202 or 206, 220 or 276, 243, EAd 241 or 242 or 243. For professional degree, CE 211 or 217 or 223, EngS 284 or OR 201, one additional course from the sequence EAd 241, 242, 243.

Transportation Option:
Required courses for degree programs: MS—CE 201 or 202, 210, 220, 221 or 223, EngS 251; professional or DSc—ApSc 212, 213 or 214, CE 252, EngS 221 or 315, 285, 288.

Solid Mechanics and Materials Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III

†For course descriptions, see the *Undergraduate and Graduate Programs Bulletin*.

ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 207: Soil Dynamics
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 217: Analytical Mechanics
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 229: Transformations in Materials
EngS 230: Deformation of Materials
EngS 231: Structure of Materials
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 236: Experimental Techniques in Materials Science
EngS 237: Environmental Effects on Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 242: Materials Recycling and Recovery
EngS 249: Special Topics in Materials Science
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 298: Research
EngS 299–300: Thesis Research
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 295: Statistical Thermodynamics
ME 310: Mechanics of Non-Newtonian Fluids
†BiSc 272: Electron Microscopy
†Chem 207: Chemical Bonding
†Chem 211–12: Physical Chemistry
†Chem 213: Chemical Thermodynamics
†Chem 216: Statistical Mechanics
†Geol 113: Crystallography
†Phys 167: Principles of Quantum Physics
†Phys 168: Applied Quantum Physics
†Phys 170: Elementary Solid State Physics
†Phys 211: Advanced Mechanics
†Phys 221–22: Quantum Mechanics
†Phys 224: Statistical Mechanics

†For course descriptions, see the *Undergraduate and Graduate Programs Bulletin*.

†Phys 243: Solid State Physics: Structure and Binding
†Phys 244: Solid State Physics: Electronic Processes in Metals

Required courses for degree programs in solid mechanics: MS—ApSc 211, 213; EngS 218, 221. Professional degree—EngS 222, 240, 241, 256, 285. DSc—ApSc 212, 215; EngS 222, 230, 256, 315.

Required courses for degree programs in materials engineering: MS—ApSc 211, 213; EngS 229, 231. Professional degree—EngS 234, 237, 240, 241. DSc—ApSc 212; EngS 230, 315.

Structural Engineering

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: **Design of Metal Structures**
CE 202: Design of Reinforced Concrete Structures
CE 203: **Prestressed Concrete Structures**
CE 204: **Applied Soil Mechanics I**
CE 205: **Applied Soil Mechanics II**
CE 206: **Foundation Engineering**
CE 207: **Soil Dynamics**
CE 210: **Methods of Structural Analysis**
CE 215: Urban Construction Technology
CE 250: **Advanced Metal Structures**
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 261: Analysis of Plates and Shells
CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CE 298: **Research**
CE 299–300: **Thesis Research**
CE 398: **Advanced Reading and Research**
CE 399: **Dissertation Research**
EngS 215: Advanced Strength of Materials
EngS 221: **Theory of Elasticity I**
EngS 233: **Mechanics of Composite Materials**
EngS 234: **Composite Materials**
EngS 240: **Fracture Mechanics**
EngS 241: **Failure of Materials**
EngS 256: **Introduction to the Theories of Inelastic Media**
EngS 259: **Random Vibration of Structures**
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering

†For course descriptions, see the *Undergraduate and Graduate Programs Bulletin*.

EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

Required courses for degree programs: MS—ApSc 213, CE 201 or 202, 210; EngS 215, 284, 285. Professional—CE 250 or 251, 252 or 253, 266 or 267; EngS 282 or 288. DSc—ApSc 212, 213 or 214, CE 252; CE 254 or EngS 259; EngS 221, 288.

Structures and Dynamics

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
†CE 207: Soil Dynamics
†CE 210: Method of Structural Analysis
†CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
†CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazard I
†CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazard II
EE 157: Machine and Assembly Language Programming
†EngS 215: Advanced Strength of Materials
†EngS 217: Analytical Mechanics
†EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
†EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
†EngS 240: Fracture Mechanics
†EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
‡EngS 281: Advanced Programming Techniques for Engineering Mechanics Problems
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
‡EngS 286: Analysis and Design of Thin-Walled Structures
‡EngS 287: Automated Design of Complex Structures
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
†EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
‡ME 223: Aeroelasticity
‡ME 248: Seminar: Aircraft Design I

†Course offered on campus only
‡Course offered at NASA–Langley Research Center only

OR 251: Linear Programming
OR 252: Nonlinear Programming

Required courses for degree programs on campus: MS—ApSc 213, CE 253, 261, 263; EngS 215, ME 215 or CE 252. DSc—ApSc 212, 214 or 215, ME 216, EngS 221, 259.

Required courses for degree program at NASA Langley Research Center: MS—ApSc 213; CE 261 or 263; EngS 221 or 234, 284, 285, 286 or 287. DSc—ApSc 214; EngS 281, 288; ME 215 or 223.

Water Resources Engineering

Option 1: Water Resources Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 243: Environmental Impact Assessment
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 273: Water Supply Engineering
CE 274: Mechanics of Water Waves
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 279: Unit Operations in Environmental Engineering
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 221: Intermediate Fluid Mechanics
ME 277: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 312: Theory of Turbulence
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 273: Digital Systems Simulation

Required courses for degree programs: MS—ApSc 211 and/or 213 (depending on adviser's approval); CE 212, 213, 282 or 312 (depending on adviser's approval). Professional and DSc—ApSc 211, 213; CE 282, 312; ME 221.

Option 2: Water Resources Planning

ApSc 213: Analytical Methods in Engineering III
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 273: Water Supply Engineering
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 279: Unit Operations in Environmental Engineering
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 211–12: Engineering Administration
EAd 269: Elements of Decision Making and Problem Solving
EAd 283: Systems Engineering I
EAd 284: Systems Engineering II
EngS 206: Technology and Human Needs
EngS 213: Renewable Resources
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 377: Advanced Stochastic Models in Operations Research
†Econ 217–18: Survey of Economics
†Econ 235: Energy Resources and Policy
†Econ 237: Seminar: Economics of the Environment and Natural Resources
†Geog 222: Seminar: Resources and the Environment
†Geog 223: Seminar: The Population–Food Balance
†PSc 206: Science, Technology, and Public Affairs

Required courses for MS degree: CE 212, 213, 276, 280.

Civil Engineering Graduate Courses

201 Design of Metal Structures (3)
Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box-type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

202 Design of Reinforced Concrete Structures (3)
Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box-type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

†For course descriptions, see the *Undergraduate and Graduate Programs Bulletin*.

203 **Prestressed Concrete Structures** (3)
Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)

204 **Applied Soil Mechanics I** (3)
Theories of soil strength, bearing capacity of shallow foundations and their design, deep foundations, including pile types and design criteria, theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Spring)

205 **Applied Soil Mechanics II** (3)
Nature of soil, including geological and pedological aspects; flow of water in soil, seepage involving foundations, dams, and wells; stress distribution in earth masses, one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Fall)

206 **Foundation Engineering** (3)
Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of Department. (Spring)

207 **Soil Dynamics** (3)
Stress–strain behavior of soil under transient and repeated loads, effects of earthquakes upon foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (As arranged)

208 **Rock Engineering** (3)
Classification and properties of rock, nature of rock masses and rock discontinuities, field exploration, methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of Department. (As arranged)

209 **Probabilistic Methods in Geotechnical Engineering** (3)
Review of probability concepts; probabilistic theory for particulate media; variability of soil properties; applications of reliability analysis to geotechnical problems such as shallow foundations and soil slopes; decision analysis in geotechnical engineering. (As arranged)

210 **Methods of Structural Analysis** (3)
Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques, consideration of plastic collapse of structures; introduction to the finite element method. Prerequisite: graduate status. (Fall)

211 **Physical and Chemical Wastewater Treatment** (3)
Theory and application of physical and chemical operation and processes for wastewater treatment. Topics of discussion will include sedimentation, flotation, disinfection, coagulation, flocculation, filtration, carbon adsorption, reverse osmosis, and ion exchange and thickening. Prerequisite: CE 197 or equivalent; prerequisite or concurrent registration: CE 241. (Fall)

212 **Open Channel Flow** (3)
Types and regimes of flow; energy and momentum principles, uniform flow, gradually varied flow, spatially and rapidly varied flow. Flow in nonprismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)

213 **Hydraulic Structures** (3)
Forces on structures and hydraulic design criteria. Design of conveyance, diversion, cross drainage, protective and water measurement structures. Prerequisite: CE 212 or approval of Department. (Spring)

214 **Design of Dams** (3)
Project planning and investigations. Types of dams; design of earth, rock fill dams and concrete gravity dams. Design of outlets, spillways, and appurtenances. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)

215 **Urban Construction Technology** (3)
Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of Department. (Spring)

216 **Advanced Hydrology** (3)
Precipitation, evaporation, and transpiration. Soil physics; stream flow; drainage basins, hydrograph analysis, and stream-flow routing. Design criteria, flood frequency statistics and analysis, flood forecasting and control, water supply forecasting. Prerequisite: CE 195 or equivalent. (Spring, even years)

219 **Groundwater and Seepage** (3)
Permeability theory of groundwater flow, flownets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: ApSc 211. (Fall)

220 **Urban Transportation Engineering** (3)
Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for the selection between alternative solutions. Prerequisite: approval of Department. (Fall)

221 **Pavement and Runway Design** (3)
Pavement types, wheel-load characteristics; stresses in pavements and subgrades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202; 204 or 205. (Spring)

222 **Stations and Terminals** (3)
Unified treatment of the functions and operations of stations and terminals of transportation systems, emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intramodal and intermodal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of Department. (Spring)

223 **Traffic Engineering** (3)
Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena; traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior, road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited-access expressways; examples of traffic control system implementations. Prerequisite: approval of Department. (Fall)

237 **Advanced Sanitary Engineering Design** (3)
Basic principles and practical considerations; hydraulic and structural requirements, basic parameters and elements of design, layout and design of water supply and sewage systems, pumping stations, and wastewater treatment plants, development of design parameters; cost and financing, existing plant expansions. Prerequisite or concurrent registration: CE 211, 272. (Fall)

240 **Environmental Microbiology** (3)
Basic cellular organizations and processes related to waste treatment; microorganisms as disease-carrying agents in natural and waste water; laboratory tests for coliform organisms and viruses; and analysis of activated sludge. Prerequisite: approval of Department. (Spring)

241 **Environmental Chemistry** (3)
Chemical composition and chemical analysis of water; chemical treatment of water and waste water; laboratory tests of solids, BOD, COD, phosphorus, nitrogen, etc., as related to water quality. Prerequisite: approval of Department. (Fall)

242 **Solid Waste Disposal** (3)
Characteristics of solid waste; collection, transportation, and disposal practices; regional planning and management; resource and energy recovery from solid waste. Prerequisite: approval of Department. (Fall, even years)

243 **Environmental Impact Assessment** (3)
Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution control facilities, and industrial and community development. Prerequisite: approval of Department. (Fall)

250 **Advanced Metal Structures** (3)
Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

251 **Advanced Reinforced Concrete Structures** (3)
Conception, analysis, and design of low-rise and high-rise buildings by ultimate strength methods, precast systems, progressive collapse, earthquake considerations, domes, folded plates, shell-type structures and special topics. Prerequisite: CE 202 or equivalent. (Spring)

252 **General Structural Dynamics** (3)
Analysis of single- and multiple-degree-of-freedom structural system under steady-state and transient loads; response of discretized structural systems, such as rigid frames, plates, and thin shells under dynamic loads. Prerequisite: CE 210, or equivalent and approval of Department. (Spring)

253 **Failure and Reliability Analysis of Engineering Structures** (3)
Operational and structural failure mechanisms; fracture and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Reliability of structural systems in design service life; perturbation, Monte Carlo simulation, and proof test methods; inspection and repair maintenance. Prerequisite: ApSc 115 or equivalent. (Fall)

254 **Special Topics in Structural Engineering** (3)
Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 and approval of Department. Topic announced in the *Schedule of Classes*. (As arranged)

255 **Coastal Processes** (3)
Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates, sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical

bypassing; beach nourishment; wind transport of sandy dune stabilization, sediment tracing. Prerequisite: approval of Department. (Spring)

256 **Introduction to Ocean and Coastal Engineering** (3)
Application of wave mechanics to the analysis of wave motion in coastal and offshore regions: reflection, diffraction, refraction. Wave spectra: procurement of spectral data by direct measurement or from hind-casting techniques. Beaches and littoral drift, mixing processes, outfalls and intakes in the oceans and estuaries, wave forces on coastal and offshore structures, harbor oscillations, tides in estuaries. Prerequisite: ApSc 115, ME 221; or equivalent. (Fall)

257 **Harbor and Coastal Engineering I** (3)
Waves and swells, tides and currents, coastal regime, estuaries and deltas, structures for coastal protection, principles of harbor navigation, harbor planning and harbor design, breakwaters and sea walls, quays, docks, internal access structures. Maintenance of external and internal access, dredging. Prerequisite: CE 256. (Spring)

258 **Harbor and Coastal Engineering II** (3)
Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures, off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equipment. Prerequisite: CE 252 or equivalent, 257. (Fall)

261 **Analysis of Plates and Shells** (3)
Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 **Design of Plate and Shell Structures** (3)
Design of long-span plate and shell roof structures in reinforced concrete and metal, design of containers for fluids and granular materials, computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall)

263 **Theory of Structural Stability** (3)
General criteria for stability, buckling of elastic and inelastic columns and frames, torsional and lateral buckling, variational methods. Buckling of plates and shells under static loads, stability of stiffened structures, effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 **Special Topics in Geotechnical Engineering** (3)
Selected topics such as rheology of soils, computer applications, excavating and tunneling, ocean engineering problems, or other special topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

266 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I** (3)
Nature of dynamic loads in problems arising from earthquakes, tornadoes, hurricanes, and recurring winds. Other natural hazard loading such as floods, expansive soils, storm surges, and tsunamis: characteristics of earthquakes; seismicity, zoning maps, response spectra, wind characterization, and wind tunnel simulation. Use of probabilistic concepts in load determination. Prerequisite: approval of Department. (Spring)

267 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II** (3)
Brief review of natural hazard loadings and random formulation; earthquake and wind design considerations and procedures; review of code requirements and specifications; balanced risk approach for natural hazards; cost effectiveness of integrated natural hazard design; special problems. Prerequisite: CE 266 or approval of Department. (Fall)

271 **Theoretical Marine Hydromechanics** (3)
Introductory course. Derivation of the fundamental equations and boundary conditions of fluid media, application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of Department. Offered off-campus only. (As arranged)

272 **Biological Wastewater Treatment** (3)
Theory and application of biological methods for wastewater treatment. Principles of biological treatment, biological lagoons; trickling filter activated sludge process, anaerobic and aerobic digestion of sludge. Prerequisite or concurrent registration: CE 240. (Spring)

273 **Water Supply Engineering** (3)
Quantity and quality aspects of water supply engineering are discussed. Topics include reservoir sizing, groundwater, distribution systems, treatment processes and chemistry of waters. Prerequisite or concurrent registration: CE 240, 241. (Spring)

274 **Mechanics of Water Waves** (3)
Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude, shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state of the art based on correlation between theory and measurements. Wave breaking and reflexion. Prerequisite: ME 221, or equivalent and permission of instructor. (Fall)

275 **Special Topics in Ocean Engineering** (3)
Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of Department. (Spring)

276 **Water Resources Planning and Control** (3)
The parameters of water resources planning and control; economics of water resources and related natural resources; economics of water quality control; physical parameters of water resource development; water resources law. Prerequisite: approval of Department. (Fall)

277 **Industrial Waste Treatment** (3)
The nature of industry and waste generation, industrial waste characteristics; waste measurements, techniques used in industrial waste treatment and control, nuclear waste control, reuse of industrial effluents and sewage for industrial process water, problems associated with treatment and disposal of industrial wastes and their effects on receiving waters. Prerequisite: CE 211 or equivalent, prerequisite or concurrent registration: CE 240. (Fall, odd years)

278 **Pollution Transport System** (3)
Distribution of pollutants in natural waters and atmosphere; diffusive and advective transport; mathematics for stream pollutant deoxygeneration rates, groundwater pollution transport, sediment transport, thermal transport, numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall, odd years)

279 **Unit Operations in Environmental Engineering** (3)
Lecture and laboratory. Investigation of unit processes used in water and wastewater treatment. Review of current literature. Experiments. Prerequisites or concurrent registration: CE 211, 272. (Spring, even years)

280 **Water Resources Systems** (3)
Water resources planning and control, water quality planning, water supply planning, comprehensive planning and management. Case studies of systems. Prerequisite: CE 276. (Spring)

281 **Special Topics in Water Resources** (3)
Morphometric properties of drainage basins; drainage network analysis; hydraulic geometry of streams; advanced hydraulics of alluvial channels; modeling of drainage basins; computer applications; stochastic hydrology. Prerequisite: approval of Department. (As arranged)

282 **Hydraulic Modeling** (3)
Dimensional analysis and similitude. Types of models; physical, mathematical. Distortions in physical models. Erodible bed models. Prerequisite: CE 193 or ME 221 or graduate status. (Spring, odd years)

283 **Special Topics in Environmental Engineering** (3)
Selected topics, such as Public Health Engineering, Sludge Treatment and Disposal, Advanced Chemistry for Environmental Engineers. (As arranged)

298 **Research** (arr.)
Basic research projects, as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

310 **Sedimentation Engineering** (3)
Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of Department. (Fall)

311 **Mechanics of Alluvial Channels** (3)
Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of Department. (Spring)

312 **Advanced Hydraulics** (3)
Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Spring, even years)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

Mechanical Engineering Graduate Courses

An asterisk indicates that a course is offered at NASA–Langley Research Center and may be offered on campus when arranged.

204 **Advanced Instrumentation Techniques** (3)
Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques, digital techniques; signal multiplexing; use of computers, error analysis and data handling. Lecture and laboratory. Prerequisite: approval of Department. (Fall)

215 **Theory of Vibrations** (3)
Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of Department. (Fall)

216 **Structural Dynamics (3)**
Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215. (As arranged)

218 **Design of Floating and Submerged Marine Vehicles (3)**
Consideration of interaction between hydrodynamics, propulsion, and configuration aspects of design of floating structures and vehicles; effects of submergence and deep submergence; hydrofoil and vertical jet action; structural considerations. Prerequisite: EngS 228. (Fall)

221 **Intermediate Fluid Mechanics (3)**
The continuum, kinematics of fluids, stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations, source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics; methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of Department. (Fall)

222 **Applied Fluid Dynamics (3)**
Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing–body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effect of wing sweep, area ruling concept; supersonic linearized wing theory; similarity rules. Prerequisite: ME 221 or equivalent. (Spring)

223 **Aeroelasticity (3)**
Introduction to aeroelastic phenomena; structural deformations of vehicles under static and dynamic loads; vibrations of vehicle structures; static aeroelastic problems (structural deformation, divergence control effectiveness, and reversal); flutter theory and calculation of flutter boundaries; aerodynamics of steady and nonsteady two-dimensional wings in subsonic, sonic, and supersonic flow; strip theory applications of two-dimensional aerodynamics to three-dimensional lifting surfaces, piston theory and Newtonian-flow theory. Prerequisite: ME 215, 221, or equivalent. (Fall)

224 **Fundamentals of Combustion Engines (3)**
Classification of combustion engines. Air cycles, vapor cycles, external combustion engines, internal combustion engines, rotary engines, reciprocating engines, and turbomachinery; ideal cycle analysis, engine heat losses and friction, practical cycle analysis status of computerized cycle analysis; combustion and knocking, carburetion and fuel injection; mixture distribution; valve mechanism, ignition systems, combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of Department. (As arranged)

225 **Turbomachinery I (3)**
Turbine, compressor, and pump types and uses, dimensional analysis of turbomachines, cycle analysis of gas and steam turbines, energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

226 **Turbomachinery II (3)**
Aerodynamics of aerofoils, flow in cascades, axial compressor aerodynamic design, axial turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 **Viscous Flow (3)**
Exact solutions of Navier–Stokes equations, the small Reynolds number approximations, laminar boundary-layer theory and techniques for its solu-

tion, stability of laminar flows, Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory, applications to heat transfer problems, flow separation. Prerequisite: ApSc 213; ME 221 or equivalent. (Fall)

231 **Hydrodynamics** (3)
Flow at large Reynolds number: vorticity dynamics, Kelvin's theorem in inviscid flow, vorticity in motions generated from rest, boundary layers, applications of the momentum theorem. Irrotational flow theory, applications of Bernoulli and momentum theorems to steady flows, flow due to a rigid body, two-dimensional motion and applications of complex variable theory, free surface flows, Froude numbers, criterion of dynamic similarity. Effectively inviscid flow with vorticity: sheet vortex, flow with swirl, vortex system of a wing. Prerequisite: ME 221 or equivalent. (Spring)

235 **Compressible Flow** (3)
Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Karman-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; ME 221 or equivalent. (Spring)

237 **Energetics of Fluid Flow I** (3)
Classification of fluids; criteria for identifying flow regimes, i.e., continuum, rarefied, relativistic, and quantum flows. Dimensional analysis and similitude. Derivation of species conservation equations, derivation of conservation equations when external body forces are applied, e.g., magnetofluidmechanics. High-speed chemically reacting flows, i.e., aerothermochemistry. Introduction to computational fluid dynamics. Prerequisite: approval of Department. (Spring, even years)

238 **Energetics of Fluid Flow II** (3)
Nonsteady flows. Application of theories presented in ME 237 to advanced energy conversion devices and processes. Approaches to improving the performance of energy devices, chosen by their technological timeliness and/or students' interests. Prerequisite: ME 237. (As arranged)

240 **Kinematic Synthesis** (3)
Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Review of recent developments and current research. Term project. (Spring, even years)

241 **Engineering Systems Design** (3)
Principles of systems design, interdisciplinary system simulation for mechanical, electrical, fluid, and thermal sciences, dynamic response of systems; mathematical model and analogy studies, optimization techniques with computer-aided solutions. Prerequisite: approval of Department. (Fall, even years)

242 **Advanced Mechanisms** (3)
Emphasis on spatial kinematics but with some attention to classical theorems of plane kinematics. Analysis and synthesis of mechanisms. Analytical techniques using matrices, dual numbers, quaternion algebra, finite and instantaneous screws, theory of envelopes. Applications to design of linkages, cams, gears, machined surfaces. Use of digital computers in mechanism analysis and design. Prerequisite: ME 240. (Spring, odd years)

243 **Advanced Mechanical Engineering Design** (3)
Design of mechanical engineering systems, components, and equipment, requires the integration of engineering disciplines at an advanced level. Prerequisite: approval of Department. (Fall, odd years)

246 **Electromechanical Control Systems** (3)
Advanced techniques for system synthesis, compensation, and stabilization. Linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Time domain analysis and synthesis using state space methods and matrix differential equation techniques. Introduction to digital control theory and its applications. Prerequisite: ME 182 or equivalent. (Fall)

*248 **Seminar: Aircraft Design I** (3)
Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of Department. (As arranged)

*249 **Seminar: Aircraft Design II** (3)
Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design trade-offs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft, supersonic cruising aircraft. Prerequisite: approval of Department. (Spring)

255 **Urban Transportation Technology** (3)
Introduction to technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life-cycle costs, and measures of system effectiveness. Prerequisite: approval of Department. (Fall)

257 **Energy Technology I** (3)
Supply and demand forecasting techniques: Delphi, scenario writing, relevance-free analysis, regression analysis, introduction of extremal statistics, morphological analysis. Technology assessment, life-cycle costing, environmental limitations. Input-output analysis. Net energy analysis. Second-law (exergy) analysis. Computer modeling of energy systems. Prerequisite: approval of Department. (Fall)

258 **Energy Technology II** (3)
State-of-the-art evaluation of energy systems, including solar photovoltaics, space power systems, tidal, geothermal, magneto- and electrohydrodynamics, nuclear fission, controlled thermonuclear energy, wind energy conversion, fuel conversion and synthesis, food-energy relation, structural aspects of electric utilities. May be taken independent of ME 257 upon approval of Department. (Spring)

259 **Solar Heating of Buildings** (3)
Availability of solar energy, solar radiation data. Radiation characteristics of materials, methods of solar energy collection and storage. Theory of flat-plate collectors; flat-plate collector performance. Review of other types of collectors. Solar energy storage. System thermal calculations and experiments. Design of solar water heating and heating systems. Principles of passive solar heating. Solar process economics. Review of principles of solar cooling of buildings. Prerequisite: approval of Department. (Fall)

260 **Heating and Air Conditioning of Buildings** (3)
Basic concepts and engineering data including psychometrics and comfort conditions. Heating and cooling load calculations, computer programs for system design and for energy consumption analysis. Codes and standards for building energy management, energy conservation opportunities. Heating and air conditioning systems; all air, air and water, all water, and central control systems. Cost estimates and economic analyses, life-cycle costing. Prerequisite: ME 187 or equivalent. (Spring)

261 **Air Pollution I** (3)
Introductory course on the generation, monitoring, and control of air pollution. Atmospheric pollutants; current levels and health problems. Combustion chemistry and mixing. Application to automobile and power plant controls. Photochemical processes, smog and measurements. Atmospheric dispersion; inversion and acid rain. Prerequisite: approval of Department. (Fall)

262 **Air Pollution II** (3)
Current and future trends in the design of nonpolluting automotive sources. Atmospherics of pollution diffusion and long-term chemical evolution. Weather interaction. Diagnostic techniques and remote sensing. Air pollution standards. Noise control. Prerequisite: ME 261 or equivalent. (Spring)

264 **Air Pollution Seminar** (3)
Special interest and advanced topics not covered in ME 261 or 262. Special lectures by individual experts. Participants are required to conduct a special topic study for contribution to the seminar. Prerequisite: approval of Department. (Fall)

267 **Power Plant Pollution Control** (3)
The control of existing emissions from stationary sources. Aerosol controls; sedimentation, precipitation, filtration, and wet collection. Application of scrubbers, catalysts, and combustion modification to control of gaseous emissions from stationary sources. Special techniques for fine particulate control (fabric, electrostatics). Waste disposal. Alternative power systems and future design concepts. Thermal pollution. Prerequisite: ME 261 or equivalent. (Fall)

*269 **Wind Tunnel Research Techniques** (3)
A comprehensive survey of wind tunnel research facilities and techniques; subsonic, transonic, supersonic, and hypersonic facilities; basic principles of wind tunnel design; associated research equipment including models, balances, instrumentation, and flow visualization techniques; data acquisition and reduction; research methods; static and dynamic testing techniques; powered-model testing; typical research data; significant research contribution. Prerequisite: approval of Department. (Spring)

*270 **Aerodynamics of Flight Vehicles** (3)
Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent. (Spring)

*271 **VTOL Aircraft Technology** (3)
Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects, transition aerodynamics, theoretical stability and control and correlation with flight data, ground-effect theory and experiment, handling-qualities criteria, elements of instrument approach and landing problem. Prerequisite: approval of Department. (Spring)

*272 **Powered-Lift Technology** (3)
Basic principles of powered-lift aircraft; high-lift aerodynamics; low-speed stability and control; fundamentals of internally blown and externally blown powered-lift concepts; the spanwise blowing scheme to delay wing stall, use of powered-lift for improved maneuverability of fighter aircraft; aerodynamic ground effects; alleviation of noise of powered-lift systems; aerodynamic loads associated with blown flaps. Prerequisite: approval of Department. (Fall)

*273 **Principles of Automatic Flight Control** (3)
Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response, equalization effects of nonlinearities and noise. Prerequisite: approval of Department. (Fall)

*274 **Principles of Flight Guidance** (3)
Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 **Stability and Control of Vehicles** (3)
Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency response analysis. Prerequisite: approval of Department. (As arranged)

*276 **Mechanics of Space Flight** (3)
First- and second-order Hamilton–Jacobi perturbation theory applied to artifical satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of Department. (As arranged)

277 **Numerical Methods in Viscous Flow** (3)
Review of the equations of motion, Levy–Lee transform of the compressible boundary-layer equations, methods of finite differencing, structure of the finite difference solver, boundary conditions, detailed review of integrated compressible boundary-layer code, sample solutions. Prerequisite: ME 227 or equivalent. (Spring)

*279 **Special Topics in Flight Sciences** (3)

280 **Intermediate Thermodynamics** (3)
Macroscopic and microscopic descriptions of thermodynamic systems. Fundamental equation, conditions of equilibrium and stability of thermodynamic systems. Review of methods of statistical thermodynamics, microstate, macrostate, and thermodynamic probability. Classical and quantum statistics. Properties of perfect gases and crystals. Review of elements of kinetic theory and transport phenomena. Chemical equilibrium and selected applications. Prerequisite: approval of Department. (Fall)

281 **Nonequilibrium Thermodynamics** (3)
Equations of state and potential functions. Criteria of nonequilibrium processes. Comparison of nonequilibrium process approaches, i.e., thermodynamic and rational mechanics. Constitutive relations. Onsager's reciprocity relations. Nonlinear transport and coupled transport phenomena. Prigogine's diagram technique. Prerequisite: ME 280 or equivalent. (Spring, odd years)

283 **Nuclear Reactor Engineering I** (3)
World energy resources and the importance of fission energy; atomic and nuclear structure, nuclear fission and chain reaction; critical mass; nuclear reactor classification; history of reactor development; nuclear reactions and radiations, radioactive decay; radiation detection, hazards, and protection; neutron reactions, neutron diffusion and slowing down, the criticality condition; reflected reactors, homogeneous and heterogeneous reactor systems; transient reactor behavior and control; description of pressurized and boiling water reactors; other reactor systems. Environmental considerations; reactor safety. Prerequisite: approval of Department. (Fall)

284 **Nuclear Reactor Engineering II** (3)
Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor material problems; reactor fuels; shielding; mechanical and structural components; preliminary reactor design; fuel cycles, description of nuclear reactor systems; engineered safety systems; the economics of nuclear power. Prerequisite: ME 283. (Spring)

*285 **Reaction Kinetics** (3)
Theoretical aspects of kinetics of homogeneous and heterogeneous reactions in gaseous and liquid systems. Prerequisite: ME 280 (Spring)

286 **Special Topics in Mechanical Engineering** (3)
Prerequisite: approval of Department. (As arranged)

287 **Heat Conduction** (3)
Conduction of heat through solid, liquid, and gaseous media; formulation and methods of analytical, numerical, and analog solutions; steady two- and three-dimensional problems, problems in unsteady heat conduction; conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall)

288 **Convective Heat and Mass Transfer** (3)
Heat and momentum transfer in laminar and turbulent flow; application of boundary-layer theory to problems of forced convection, the laminar boundary-layer and similarity solutions; heat convection in turbulent flow, momentum-heat transfer analogy; the influence of temperature-dependent fluid properties; convective heat transfer at high velocities; mass transfer, formulation of a simplified theory; some solutions to the conserved property equation. Prerequisite: ME 221 or equivalent. (Spring)

289 **Radiative Heat Transfer** (3)
Nature of thermal radiation, laws of intensity attenuation and generation; solid angles and frequency spectrum; flames, solar ponds, beam energy transmission; surface properties and view factors; design of furnaces and radiant boilers, radiation vs. convection processes; reentry, lasers. Applications to optical temperature diagnostics, emission, absorption, and scattering techniques, remote sensing. Prerequisite: approval of Department. (Fall, even years)

*290 **Kinetic Theory of Gases** (3)
Equation of state and physical properties for gas composed of discrete particles, relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities, Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction, imperfect gases, flow of gases at low density. Prerequisite: ME 280. (Spring)

291–92 **Power Systems** (3–3)
Design of thermal power system components and system optimization. Steam-cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations, testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 **Combustion** (3)
Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of Department. (Spring)

295 **Statistical Thermodynamics** (3)
Distribution functions, Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; partition functions, correspondence between classical and statistical thermodynamics. Systems with negligible effects of interparticle forces, perfect gases, perfect electron gas, photon gas. The Debye solid, the Einstein solid. Prerequisite: ME 280 (Spring, even years)

296 **Special Topics in Heat and Mass Transfer** (3)
Prerequisite: approval of Department. (As arranged)

297 **Special Topics in Fluid Mechanics** (3)
Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

310 **Mechanics of Non-Newtonian Fluids** (3)
Classification of fluids; physical properties of composite fluids; convected coordinate systems; fundamentals of constitutive equations of composite fluids, purely viscous fluids, Reiner and Rivlin theories, power-law fluids; linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear viscoelasticity; nonlinear theory of viscoelasticity, Rivlin–Ericksen theory; viscoplastic fluids, Bingham plastic fluids, Oldroyd's analysis; viscometry and rheogoneometry; turbulent flow of suspensions and emulsions in pipes; fractional drag reduction by polymeric additives. Prerequisite: approval of Department. (Fall)

311 **Nonsteady Flow** (3)
Eulerian and Lagrangian kinematics. Fundamental equations of nonsteady viscous flow. Characteristics and waves; initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows with entropy production. Discontinuities, interactions, and special transients. Gas dynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or 237, or equivalent. (Fall)

312 **Theory of Turbulence** (3)
Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall turbulence, turbulence in atmospherical environment and effects on air-pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (Fall)

313 **Magnetofluidmechanics** (3)
Thermodynamics and fluid mechanics of electrically conducting liquids and gases; theory and applications; thermodynamics and transport properties of plasmas formulated, reaction kinetics and plasma reactions, fundamental equations (mass, momentum, and energy) of magnetofluidmechanics; flow with infinite and finite conductivity. Alfven waves and wave phenomena, flow with heat transfer and friction, relativistic magnetofluidmechanics, dimensional analysis and scaling parameters, applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221, 280. (As arranged)

315 **Hypersonic Flow** (3)
Shock waves in hypersonic limits, one-dimensional piston problem, and method of characteristics. Hypersonic small disturbance theory and exact solutions. Unsteady analogy and similarity parameters. Newtonian flow theory for slender and blunt bodies. Tangent wedge/cone approximation and shock expansion theory. Delta wing problems. Hypersonic viscous interaction phenomena and real gas effects. Features of hypersonic boundary layers and local similarity approximations. Prerequisite: ME 235, ApSc 211, 212. (As arranged)

317 **Physical Gas Dynamics** (3)
Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235, 295 or equivalent. (Spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

Engineering Science Graduate Courses

An asterisk indicates that a course is offered at NASA–Langley Research Center and may be offered on campus when arranged.

201 **History of Technology I** (3)
The characteristic technologies of Prehistory, the Ancient Near East, Greece and Rome, Byzantium and Islam, and Christian Europe. Technology is broadly defined. Emphasis is on its manifold interactions with other cultural forces. (Fall)

*202 **Advanced General Metrology** (3)
Topics in the conceptual, physical, and mathematical aspects of measurement, standards, design for precision measurement, and measurement at extreme values. Prerequisite: graduate status. (Fall—evening)

*203–4 **Probability and Statistics of Metrology** (3–3)
Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin square experiments; factorial experiments, block and lattice design. Prerequisite: ApSc 115 or equivalent. (Academic year—evening)

206 **Technology and Human Needs** (3)
Sociology of science and engineering. Social consequences of modern technology, including energy systems, environmental issues, transportation, communications biomechanics, and the use of computers in conjunction with it. Institutional barriers and incentives to socioeconomic progress made possible by high technology. Prerequisite: approval of Department. (As arranged)

207 **Engineering Climatology** (3)
Constitution of physical properties of Earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of Department. (As arranged)

208 **Energy Conservation** (3)
Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, and in industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low-energy consumption in large and small edifices. Environmental effects and low-fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of Department. (As arranged)

210 **Quantitative Aspects of Social Phenomena** (3)
Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Comparison of deterministic and stochastic analysis. Population growth, birth and death rates; population diffusion, Lancaster equation; Richardson's approach; the Forrester–Meadows model. Kinetic theory formulation of peaceful co-existence. Probability distributions, characteristic functions, and central limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermodynamic approach to self-rejuvenating systems and its application in government and organizations. Prerequisite: approval of Department. (As arranged)

212 **Nonrenewable Resources** (3)
Nonrenewable fossil and fissil fuel resources. The interplay of geology, engineering applications, and economics. Fossil fuels include coal, petroleum, natural gas, shale; fissil fuels include uranium and thorium. Exploration, excavation, production, and processing. Conversion techniques from solid to liquid and gaseous fuels. Environmental impacts and supply/demand issues. Prerequisite: ME 257 or approval of Department. (As arranged)

213 **Renewable Resources** (3)
Renewable energy resources, or those believed to be of practically indefinite duration. Solar energy aspects, excluding solar heating of buildings. Biomass, including food, fiber, and photosynthesis. Biological and chemical processes, pyrolysis, enzymatic hydrolysis, and hydrogenation. Solar photovoltaics, wind energy conversion systems, ocean thermal energy conversion, tidal energy, geothermal energy. Central vs. distributed energy systems. Prerequisite: ME 257 and 258 are desirable, or approval of Department. (As arranged)

214 **Geothermal Energy** (3)
Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of Department. (As arranged)

215 **Advanced Strength of Materials** (3)
Deflection of beams using singular functions, unsymmetrical bending of beams, beams on elastic foundation, beam-column problems, shear center for thin-wall beam cross-sections, curve beams, applications of energy methods, torsion, basic equations for theory of elasticity, thin- and thick-wall cylinders, stress concentration, failure criteria and elastic–plastic analysis of beams under bending and torsion.

217 **Analytical Mechanics** (3)
Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of Department. (Fall)

218 **Introduction to Continuum Mechanics** (3)
Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of Department. (Fall)

221 **Theory of Elasticity I** (3)
Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: ApSc 211; EngS 215 or 218. (Spring)

222 **Theory of Elasticity II** (3)
Application of integral transforms and analytic function theory to solution of plane problems in static and dynamic elasticity. Introduction to three-dimensional elastostatics. Prerequisite: EngS 221, ApSc 211. (Fall, odd years)

228 **Physical Oceanography** (3)
Seawater, equations of motion, interaction between air and sea, currents, wind-waves in deep and shallow waters, long ocean waves, tides, wave statistics, sea ice. Prerequisite: ME 221 or equivalent. (Spring)

229 **Transformations in Materials** (3)
Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase

transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: CE 140. (Spring, odd years)

230 **Deformation of Materials** (3)
Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion of hardening, mechanisms of creep, yield, and fracture. Prerequisite: CE 166. (Fall, odd years)

231 **Structure of Materials** (3)
Crystal structures, stereographic projection, diffraction methods, theory of metals, crystal energy, covalent bonding, metallic bonding, quantum theory of metals, insulators, semiconductors, magnetism, superconductivity, dislocation point defects, work hardening and annealing, solid solutions, precipitates, second phases, structure of real materials. Prerequisite: CE 140. (Fall, even years)

233 **Mechanics of Composite Materials** (3)
Stress–strain relationship for orthotropic materials; invariant properties of an orthotropic lamina; biaxial strength theory for an orthotropic lamina; mechanics of materials approach to stiffness; elasticity approach to stiffness; classical lamination theory; strength of laminates; statistical theory of fatigue damage for composites. Prerequisite: approval of Department. (Spring, odd years)

234 **Composite Materials** (3)
Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of Department. (Spring, even years)

236 **Experimental Techniques in Materials Science** (3)
Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray microscopy including Laue technique and Debye-Scherrer method. Electron probe microanalysis. Electron microscopy including electron optics, image formation and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: approval of Department. (Spring, odd years)

237 **Environmental Effects on Materials** (3)
Aqueous corrosion, electrochemistry, electrochemical reactions, polarization, environmental factors, intergranular corrosion, stress corrosion, high temperature corrosion, kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of Department. (Fall, even years)

*239 **Physical Ceramics** (3)
Crystal chemistry and the systematic study of the structure of ceramic materials, solid reactions occurring at elevated temperatures, sintering, vitrification, diffusional mechanisms and effects, reaction rate theory, elastic, anelastic, and plastic properties of ionic and covalent solids, viscoelastic behavior of vitreous and vitreous-solid systems, phase equilibria of ceramic systems. Prerequisite: approval of Department. (Spring)

240 **Fracture Mechanics** (3)
Fundamentals of brittle fracture. Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261. (Spring, even years)

241 **Failure of Materials** (3)
Tensile and shear deformation, yield, dislocation motion, geometry of slip, single and polycrystal deformation, twinning, creep deformation, polymer deformation, fracture, Griffith theory, fracture toughness, transition temperature, microstructure effects, environmental effects, stress corrosion cracking, cyclic stress and strain, fatigue crack initiation and propagation, statistical analysis, low cycle fatigue, failure analysis. Prerequisite: CE 166. (Fall, odd years)

242 **Materials Recycling and Recovery** (3)
Techniques and technologies for recovering and reusing waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of Department. (As arranged)

249 **Special Topics in Materials Science** (3)
Prerequisite: approval of Department (As arranged)

251–52 **Transportation Workshop** (3–3)
Students and staff from various disciplines are brought together for study of a selected transportation topic or of the land-use objectives and transportation needs of a selected urban area and a survey of pertinent information and applicable solutions. Prerequisite: approval of Department. (Academic year)

253 **Operational Control of Urban Transit Networks** (3)
General discussion of the essential functions of operation and control for various systems, with emphasis on the automation of these functions. Regulation of roadway traffic flow, management of public transit fleets, and automated control of subways and of automated guideway transit systems. Prerequisite: approval of Department. (Spring)

256 **Introduction to the Theories of Inelastic Media** (3)
Physical basis of anelasticity, viscoelasticity, plasticity, and viscoplasticity; constitutive equations of elastic and viscoelastic media; foundations of the theories of plasticity and viscoplasticity; boundary-value problems and wave propagation in inelastic media. Prerequisite: ApSc 213 or equivalent and approval of Department. (Spring, odd years)

259 **Random Vibration of Structures** (3)
Introduction to random processes; responses of linear structures to stationary and nonstationary random inputs; structural responses to earthquakes, waves, boundary-layer turbulences, wind loads, etc.; failure analysis of structures under random loads; first passage failure, fatigue, stress-corrosion and crack propagation under random stress histories. Prerequisite: ApSc 115 or CE 253. Prerequisite or concurrent registration: CE 252 or ME 215. (Spring)

260 **Random Process Theory in Engineering** (3)
Spectral analysis, linear system, the superposition principle; statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values; statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent (Fall)

*263 **Atmospheric Physics for Engineers I** (3)
Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of Department. (As arranged)

*264 **Atmospheric Physics for Engineers II** (3)
Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields, mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of Department. (As arranged)

270 **Theoretical Acoustics I** (3)
Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures, elements of classical absorption of sound. Prerequisite: ME 221, ApSc 213, or equivalent. (As arranged)

*271 **Random Process Theory I** (3)
Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction, and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of Department. (As arranged)

272 **Random Process Theory II** (3)
Discrete and continuous state Markov processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in engineering problems; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 259 or 260 or 271. (As arranged)

*273 **Time Series Analysis** (3)
Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; coherence; modern techniques for spectral estimation including periodogram, Blackman-Tukey, direct filtering, maximum entropy, and maximum likelihood; fast Fourier transform and zoom FFT, effects of finite length and digitization on bias and variability; spectral analysis with randomly sampled data; digital filtering; applications in modern technology. Prerequisite: EngS 271 or approval of Department (As arranged)

274 **Environmental Noise Control** (3)
Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise, automobile and truck noise, factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

*275 **Theoretical Acoustics II** (3)
General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite EngS 270. (As arranged)

*276 **Acoustical and Mechanical Measurements** (3)
Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

*277 **Physical Acoustics** (3)
Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

*278 **Psychological and Physiological Acoustics** (3)
Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of Department. (As arranged)

*279 **Human Factors in Engineering** (3)
Man–machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress. (Spring)

*280 **Special Topics in Acoustics** (3)
Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of Department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Mechanics Problems** (3)
Techniques for efficient construction of large computer programs for engineering systems with emphasis on fundamental structured programming principles. Application to engineering mechanics systems such as finite elements and structural optimization. Effects of CPU organization and other hardware features of computer systems at NASA–Langley on numerical computations involved in engineering systems. Organization and management of databases for large engineering mechanics systems. Prerequisite: approval of Department. (Spring)

282 **Computer-Aided Design** (3)
Fundamental concepts in the development of computational algorithms for the design of structures, machine component and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote-access computer terminals. General-purpose computer programs for engineering analysis and design. Students, individually or in groups, develop a small-scale general-purpose design program in an appropriate area, such as structural design, machine design, urban planning, environmental quality control, etc. Prerequisite: EE 51 or equivalent, CE 210 or equivalent, and approval of Department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)
Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent; or concurrent registration: EngS 284. (Spring)

284 **Numerical Methods in Engineering** (3)
Uses of computers in engineering and science; numerical interpolation, integration, and differentiation, least squares approximations and application to data fitting, roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of Department. (Fall)

285 **Finite Element Methods in Engineering Mechanics** (3)
Calculus of variations. Variational formulation of the finite element method. Techniques of constructing and assembling characteristic element matrices. Rayleigh-Ritz method. Galerkin method. Application to problems in structural mechanics, fluid mechanics, heat flow, and solid mechanics. Computer implementation of the finite element method. Convergence characteristics. Prerequisite: approval of Department. (Spring)

*286 **Analysis and Design of Thin-Walled Structures** (3)
Statics of thin-walled beams and panels; force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures, classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of Department. (As arranged)

*287 **Automated Design of Complex Structures** (3)
Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of Department. (As arranged)

288 **Advanced Finite Element Methods in Structural Mechanics** (3)
Review of variational formulation of the finite element method. Formulation of various continuum and structural elements. Application to static and dynamic problems in elasticity, plasticity, large deflection, and instability in plates and shells. Recent developments in finite element methods. Prerequisite: CE 210, EngS 285. (As arranged)

289 **Special Topics in Theoretical and Applied Mechanics** (3)
Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)
Basic research projects as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

*310 **Aeroacoustics** (3)
General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary-layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)
Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of Department. (As arranged)

*312 **Theory of Random Vibration** (3)
Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215 (As arranged)

*313 **Structural Acoustic Interaction** (3)
Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

314 **Advanced Numerical Methods in Engineering** (3)
Advanced methods for numerical solution to engineering problems: finite difference solutions to elliptic, parabolic, and hyperbolic equations, method of characteristics, implicit and explicit initial value methods and their stability, optimization and mathematical programming methods, numerical solutions to integral equations, selected topics for fourth-generation computers. Prerequisite: EngS 284, ApSc 213. (Spring)

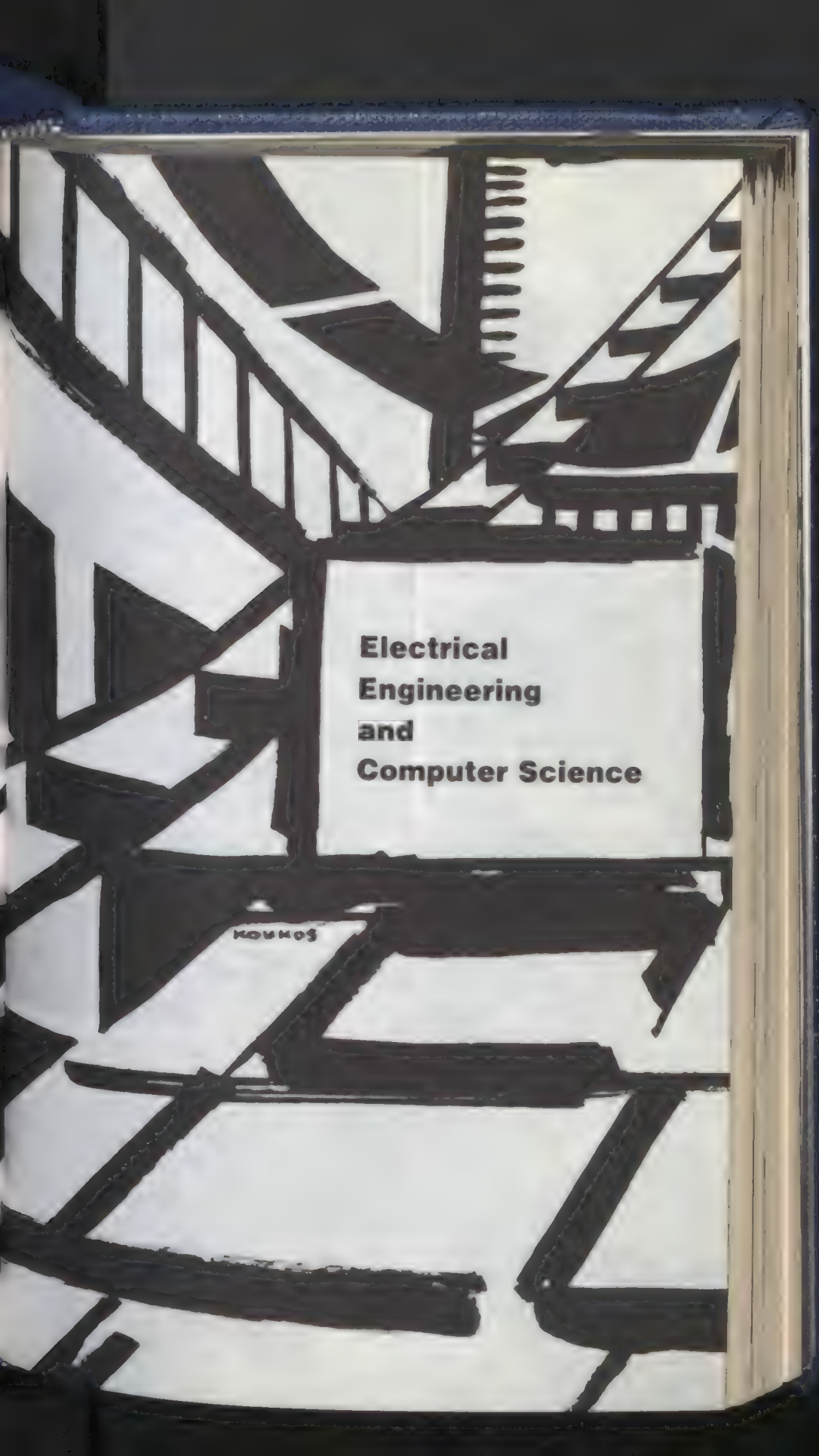
315 **Introduction to Nonlinear Mechanics of Continua** (3)
Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions; deformation, kinematics, stress, balance principles, principles for constitutive relations; applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

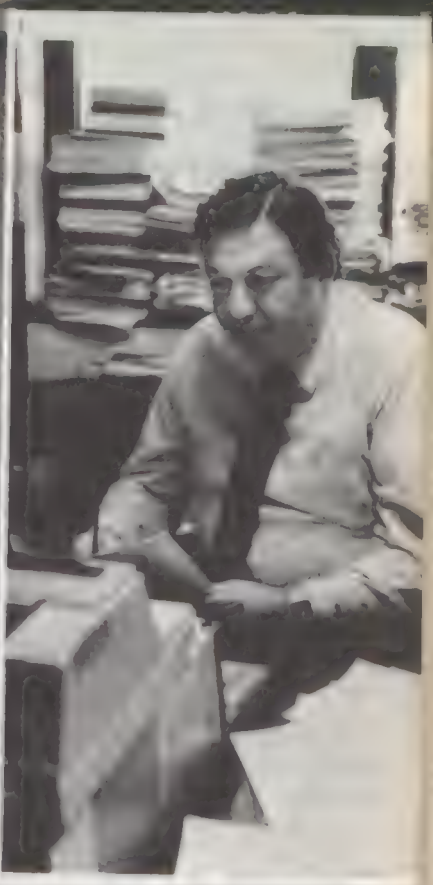





Electrical
Engineering
and
Computer Science
HOUNOS









Electrical Engineering and Computer Science

Professors R.B. Heller, W.K. Kahn, R.L. Pickholtz, M.F. Eisenberg, A.C. Meltzer, W.D. Maurer, A.D. Friedman *(Chairman)*, A.M. Abd Alla, H.J. Helgert, R.H. Lang, J.D. Foley, T.N. Lee, E. Della Torre

Professorial Lecturers J.M. Aein, W.T. Bisignani, J.T. Coleman, P.J. Crepeau, C.E. Dunham, S.H. Durrani, R.B. Edwards, W.J. Eisner, G. Frenkel, D.L. Hogan, H.-L.A. Hung, W.D. Jackson, S. Karp, P. Kelly, R.K. Khatri, L.M. Leibowitz, J.S. Lee, R.J. Leopold, M.J. Marcus, T.P. McGarty, M. Mohajerbi, L. Scharff, J.E. Shore, R. Triplett, W. Wasylkiwskyj, A.A. Wolf

Associate Professors E.H. Braun, N. Kyriakopoulos, L.J. Hoffman, R.L. Carroll, Jr., S.Y. Berkovich, M.B. Feldman, R.J. Harrington, M.H. Loew, D.C. Rohlfs *(Director of Laboratories)*, J.L. Sibert *(Research)*, P.S. Bock, A.Y.-P. Cheung *(Visiting)*

Associate Professorial Lecturers J.G. Adler, C. Alexander, Jr., R.D. Angelari, J.W. Benoit, H. Carus, M.C. Chen, C.H.T. Chu, C.-K. Cho, D.M. Engel, E.C. Foudriat, J.W. Fussell, A.S. Gill, R.A. Herring, Jr., J.C. Hsing, J.A. Knight, G.J. Kowalski, G.R. Lawrence, D.M. LeVine, G.E. Lyon, C.F.H. Manders, A.F. Manfredi, F.P. Pantuso, F.J. Ricci, D.C. Roberts, J.H. Scharen-Guivel, A. Schneider, J.R. Silverman, J.L. Torres, C.C. Wang, W.W. Wu

Assistant Professors M.E. Zaghloul, S.C. Chang

Assistant Professorial Lecturers E.S. Armstrong, T.M. Bottegal, A.I. Breitler, J.B. Bronder, F.M. Brosi, Jr., Y. Chang, T.L. Collins, R.L. Cunningham, J.S. Davies, Jr., V.R. Dhadesugoor, N. Dresner, D.E. Eckhardt, Jr., R.H. Evans, L. Fletcher, P.J. Fox, M. Fritts, Y. Fu, M.S. Gluck, T.R. Husson, S.H. Kaisler, C.E. Knadler, Jr., S.J. Koch, J.D. Kotulski, P.A. Lamb, E.B. Leiderman, D.D. Leondorf, C. McCullough, E.H. Neal, D.H. Pugh II, J.L. Rogers, J.J. Seppy, S.A. Shamma, K. Schmucker, R. Shankar, G. Shuman, D.R. Smith, R.M. Tarakan, J.S. Tripp, J.H. Tucker, E.A. Walker

The undergraduate programs of study in the Department of Electrical Engineering and Computer Science lead to the following degrees: Bachelor of Science in Electrical Engineering; Bachelor of Science in Electrical Engineering, Computer Engineering option; Bachelor of Science in Electrical Engineering, Premedical Engineering option; and Bachelor of Science in Computer Science.

Electrical Engineering Undergraduate Study

Electrical engineering as an engineering discipline is concerned with mastering a knowledge of electricity. Electrical engineers design generators, which provide electrical energy for homes and factories, and transmission networks and the motors that utilize this power to drive machinery. By developing electromagnetic radiation, electrical engineers produce radio waves for the propagation of radio and television signals and the transmission of information via satellites. Electrical engineers design and develop electronic circuits used in communications equipment and computers. These machines have enhanced our thinking and computational capabilities to permit mankind to

solve some of its most complicated problems. Microminiaturization of electronic components has permitted the development of handheld calculators and portable communication equipment. Electrical engineers are developing new instrumentation to assist the medical profession in understanding the causes of disease and to aid in preserving and prolonging life. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers. The world's primary energy sources are limited, and electrical power has become an even more important resource. Electrical engineers are involved in the research to produce electrical energy directly from solar power.

Electrical engineering is a branch of engineering in which practical, theoretical, and scientific aspects are integrated into a well-balanced discipline. Basic sciences such as physics and mathematics form the roots on which electrical engineering builds to create an applied science and to develop problem-solving techniques. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are common to all undergraduate fields in the School and allow students to develop a sound foundation of basic sciences coupled with engineering sciences. The third year continues with engineering sciences and begins an in-depth study of electrical engineering. The fourth year is devoted totally to electrical engineering. At the beginning of the fourth year the student has a choice of either following the regular electrical engineering curriculum or branching off into an area of concentration in computer or premedical engineering.

The Department of Electrical Engineering and Computer Science has modern laboratory equipment, including its own computers. The student has an opportunity during the last year to work on individual projects in which ingenuity, coupled with faculty advice and guidance, allows concentration in areas such as computers, communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate the full-time, part-time, and co-op students. Undergraduate courses are offered once a year during the day for full-time students and once every two years in the evening for part-time students.

Subject Areas

Communications

EE 143: Elements of Communication Engineering Design I
EE 144: Elements of Communication Engineering Design II
EE 146: Communications Laboratory

Computer Engineering

CSci 52: Computers and Societal Problems
CSci 55: Introductory Computer Programming
CSci 150: Introduction to Microcomputers
CSci 151: Introduction to Systems Programming I
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Systems Programming II

CSci 157: Machine and Assembly Language Programming
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
CSci 166–67: Computer Science Laboratory I and II

Controls, Systems, and Power

EE 166: Power Systems Laboratory
EE 172: Control Systems Design
EE 176: Control Systems Laboratory
EE 177: Electrical Energy Conversion
EE 178: Electrical Power Systems

Electronics

EE 20: Introductory Engineering Electronics
EE 121: Engineering Electronics and Design
EE 122: Pulse and Waveshaping Electronic Design
EE 124: Electronic Devices
EE 169: Advanced Electronics Design Laboratory

Fields and Waves

EE 31: Fields and Waves I
EE 32: Fields and Waves II
EE 133: Electromagnetic Waves and Microwave Systems Design
EE 168: Microwave and Laser Engineering Laboratory

Laboratories and Measurement

CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
EE 63: Instrumentation and Networks Laboratory
EE 65: Introductory Electronics Laboratory
EE 66: Digital Electronics Design Laboratory
EE 67: Switching Circuits Laboratory
EE 163: Senior Electrical Engineering Project Laboratory I
EE 164: Senior Electrical Engineering Project Laboratory II

Medical Engineering

EE 184: Medical Engineering Instrumentation and Systems Design
EE 186: Medical Engineering Laboratory

Networks

EE 11: Linear Networks I
EE 12: Linear Networks II
EE 113: Network Analysis and Design
EE 116: Introduction to Network Synthesis

Core Curriculum

Normally the first four semesters are common to all Electrical Engineering undergraduate degree programs and to undergraduate fields in other departments within the School of Engineering and Applied Science.

First Semester

BiSc 11: Introductory Biology for Science Majors (4) (Pre-Med only)
CSci 55: Introductory Computer Programming (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Second Semester

BiSc 12 Introductory Biology for Science Majors (4) (Pre-Med only)
Chem 13 General Chemistry (4)
CSci 52 Computers and Societal Problems (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Third Semester

ApSc 57 Analytical Mechanics I (2)
ApSc 113 Engineering Analysis I (3)
ApSc 115 Engineering Analysis III (3)
Math 33 Multivariable Calculus (3)
Phys 15 Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

Chem 22: Introductory Quantitative Analysis (4) (Pre-Med only)
ApSc 58 Analytical Mechanics II (3)
ApSc 114 Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Electrical Engineering Curriculum

Fifth Semester

EE 12 Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
CSci 157 Machine and Assembly Language Programming (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse, Digital, and Waveshaping Electronic Design (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 163: Senior Electrical Engineering Project Laboratory I (1)
Elective: Technical electives (9) (three courses selected from EE 113, 133, 178, CSci 150, 155; ME 131, 187)
Elective: Select one laboratory (1 credit) from EE 166, 168, 169

Eighth Semester

EE 144: Elements of Communication Engineering Design II (3)
EE 164: Senior Electrical Engineering Project Laboratory II (1)
EE 172: Control Systems Design (3)
Elective: Technical electives (5) (two courses selected from EE 116, 124, 160, 165, 179, 184; ME 194)
Elective: Select one laboratory (1 credit) from EE 146, 176, 186

Technical Electives

ApSc 199: Honors Research Project and Seminar (3–3)
CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
EE 113: Network Analysis and Design (3)
EE 116: Introduction to Network Synthesis (3)
EE 124: Electronic Devices (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 146: Communications Laboratory (1)
EE 160: Electrical Measurements and Instrumentation (3)
EE 165: Senior Design Project (2)
EE 166: Power Systems Laboratory (1)
EE 168: Microwave and Laser Engineering Laboratory (1)
EE 169: Advanced Electronics Design Laboratory (1)
EE 178: Electrical Power Systems (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)
EE 186: Medical Engineering Laboratory (1)
ME 131: Thermodynamics (3)
ME 187: Heat Transfer Theory (3)
ME 194: Energy Conversion (3)

Computer Engineering Option

Computer engineering is a developing discipline that combines electronic design, programming of computers, and mathematics into a comprehensive area. The student learns the design and utilization of computers for scientific and business applications. Students who complete this option will be able to

design both hardware and software needed for minicomputer and large-scale computing systems. The student will also be competent in hardware and software utilization of computers for control of large systems. The curriculum prepares the student for a career in computer design, applications, and utilization or to continue study in graduate school.

Prerequisite: first four semesters as described in the Core Curriculum.

Fifth Semester

CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods and High Level Languages (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)

Sixth Semester

CSci 153: Design of Switching Systems (3)
CSci 159: Programming and Data Structures (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse and Waveshaping Electronic Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

CSci 150: Introduction to Microcomputers (3)
CSci 151: Introduction to Systems Programming I (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 163: Senior Computer Science Project Laboratory (1)
CSci 166: Computer Science Laboratory I (1)
Elective: Technical elective (3) (selected from EE 113, 121, 133, 143)
Elective: Selected from humanities or social sciences (3)

Eighth Semester

CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Systems Programming II (3)
CSci 164: Senior Computer Science Project Laboratory (1)
CSci 167: Computer Science Laboratory II (1)
EE 172: Control Systems Design (3)
Elective: Technical elective (3) (selected from EE 124, 144, 165, 184)

Technical Electives

ApSc 199: Honors Research Project and Seminar (3–3)
EE 113: Network Analysis and Design (3)
EE 121: Engineering Electronics and Design (3)

EE 124: Electronic Devices (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 144: Elements of Communication Engineering Design II (3)
EE 165: Senior Design Project (2)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

Premedical Engineering Option

The premedical engineering option will permit the student who completes the work to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for work toward a doctor of medicine degree. The student will also have sufficient background to work in various allied health fields, in the research and development of new electronic equipment used in medicine, or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

Prerequisite: first four semesters as described in the Core Curriculum.

Fifth Semester

Chem 151: Organic Chemistry (3)
Chem 153: Organic Chemistry Laboratory (1)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
CSci 157: Machine and Assembly Language Programming (3)

Sixth Semester

Chem 152: Organic Chemistry (3)
Chem 154: Organic Chemistry Laboratory (1)
CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse and Waveshaping Electronic Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 163: Senior Electrical Engineering Project Laboratory I (1)
EE 169: Advanced Electronics Design Laboratory (1)
Elective: Selected from humanities or social sciences (6)
Elective: Technical elective (3)

Eighth Semester

EE 164: Senior Electrical Engineering Project Laboratory II (1)
EE 172: Control Systems Design (3)

EE 184: Medical Engineering and Systems Design (3)
EE 186: Medical Engineering Laboratory (1)
Elective: Selected from humanities or social sciences (6)
Elective: Technical elective (3)

Technical Electives

ApSc 199: Honors Research Project and Seminar (3–3)
Bioc 221–22: General Biochemistry (3–4)
BiSc 145: Introduction to Vertebrate Embryology (4)
BiSc 148: Histology (4)
EE 144: Elements of Communication Engineering Design II (3)

Electrical Engineering Undergraduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

11 **Linear Networks I** (3)
Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15, ApSc 113. (Spring—day and evening; Fall—evening) (Zaghloul)

12 **Linear Networks II** (3)
Singular functions, Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra, frequency response, Bode plots, two-port parameters. Prerequisite: ApSc 114, EE 11. (Fall—day and evening; Spring—evening) (Zaghloul)

20 **Introductory Engineering Electronics** (3)
Various types of devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Solid-state, vacuum, and gaseous devices. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of graphical techniques. Prerequisite: EE 11. (Fall—day and evening; Spring—evening) (Heller)

31 **Fields and Waves I** (3)
Vector calculus, orthogonal coordinates, Coulomb and Gauss laws, scalar potential, dipoles, method of images, dielectrics, capacitance, steady currents, Laplace and Poisson equations, boundary-value problems. Prerequisite: Phys 15, 16; ApSc 114. (Fall—day; Fall, even years—evening) (Kahn)

32 **Fields and Waves II** (3)
Biot–Savart law, Ampere law, vector potential, magnets, Faraday law, Maxwell equations, plane waves, and Poynting vector. Prerequisite: EE 31. (Spring—day; Spring, odd years—evening) (Kahn)

63 **Instrumentation and Networks Laboratory** (1)
Use of standard laboratory electronic instruments in the measurement of electrical and electronic components and networks. Verification of network laws and theorems. Characteristics and limitations of instruments. Applica-

tion of instruments to measure voltage, current, resistance, impedance, power, time, period, and frequency. Use of digital multimeter, frequency counter, function generator, and oscilloscope to measure steady-state and transient phenomena. Prerequisite or concurrent registration: EE 12, 20, 31 (Fall—day and evening; Spring—evening) (Rohlfs)

65 Solid-State Devices Laboratory (1)
Testing and measurement of the characteristics of solid-state devices used in electronic systems: diodes, BJTs, FETs, SCRs, timers, op amps, and ICs, applications. Design and measurement of the characteristics of power supplies, BJT and FET amplifier circuits, clipping and clamping circuits, power control circuits, and timing circuits. Prerequisite or concurrent registration: EE 12, 20, 31, 63. (Fall—day and evening; Spring—evening) (Rohlfs)

66 Digital Electronics Design Laboratory (1) (Same as CSci 66)
Characteristics of electronic devices used in switching, sweeping, and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Prerequisite: EE 65, prerequisite or concurrent registration: EE 122. (Spring—day and evening; Fall—evening) (Rohlfs)

67 Switching Circuits Laboratory (1) (Same as CSci 67)
Analysis and design of combination and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators, and arithmetic circuits. Prerequisite or concurrent registration: EE 66, 153. (Spring—day and evening; Fall—evening) (Rohlfs)

113 Network Analysis and Design (3)
Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions, properties of active networks including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. (Fall—day; Fall, even years—evening) (Lee)

116 Introduction to Network Synthesis (3)
Network functions and their properties. Positive real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Spring—day; Spring, odd years—evening) (Lee)

121 Engineering Electronics and Design (3)
Graphical analysis and design beyond the level covered in EE 20. Design of push-pull, direct-coupled, and class B and C amplifiers. Design of operational amplifiers; use in filters and electronic systems. Design of oscillators, active filters, modulators, and demodulators. Design of power supplies. Prerequisite: EE 12, 20. (Fall—day and evening) (Heller)

122 Pulse, Digital, and Waveshaping Electronic Design (3)
Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flipflops. Concepts in integrated circuit design. Design of counting and timing circuits using ICs. Pulse, sweep, and waveshaping circuits. Prerequisite: EE 12, 20. (Spring—day and evening) (Eisenberg)

124 Electronic Devices (3)
Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of electronic devices and their applications. Modeling of devices such as diodes, transistors, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 12, 32, 121, Phys 16. (Spring—day; Spring, odd years—evening) (Heller)

133 **Electromagnetic Waves and Microwave Systems Design** (3)
Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities. Smith chart, design of coaxial and waveguide systems. Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32 (Fall—day; Fall, even years—evening) (Kahn)

143 **Elements of Communications Engineering Design I** (3)
Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency, and pulse modulation. Comparison of analog and digital transmission. Time and frequency division multiplexing. Random signals and noise. Transmission systems for cable, radio, satellite, and optical links. Prerequisite: EE 121 (or concurrent registration); ApSc 114 or permission of course director. (Fall—day and evening) (Helgert)

144 **Elements of Communications Engineering Design II** (3)
Statistical theory of communications. Comparison of communications systems in noisy channels. Data communications, design of modems. Concept of information theory. Coding for noisy channels. ARQ and forward error control. Communications protocols. Elements of traffic theory. Special topics and student project. Prerequisite: EE 143 or permission of course director. May be taken for graduate credit by graduate students who are not majoring in communications. (Spring—day and evening) (Helgert)

146 **Communications Laboratory** (1)
Empirical study of several major topics in modern communications. Experiments are chosen from the areas of linear filters, random and pseudorandom processes, analog and digital communications, A/D conversion, source and channel coding, noise measurements, data security, and data networks. Prerequisite or concurrent registration: EE 12, 32, 63, 65, 121, 122, 143, 144, 153. (Spring—day and evening) (Helgert)

160 **Electrical Measurements and Instrumentation** (3)
Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high-frequency signals including field strength, signal-to-noise ratio, impedance, and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121, 150 (Spring—evening) (Heller)

163 **Senior Electrical Engineering Project Laboratory I** (1)
Conception and design of a one-year project to be completed in EE 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 67; prerequisite or concurrent registration: EE 121, 143, and senior status. (Fall—day and evening) (Meltzer)

164 **Senior Electrical Engineering Project Laboratory II** (1)
Completion and construction of the project started in EE 163. Oral and written presentation of the product designed. Prerequisite: EE 163. (Spring—day and evening) (Meltzer)

165 **Senior Design Project** (2)
Conception, design, construction, and testing of an original project in hardware or software. Complete report to include, if applicable, schematic diagrams and repair procedures. Prerequisite: senior status. (Spring—day) (Pickholtz)

166 **Power Systems Laboratory I** (1)
Experiments in support of the analysis and design of electrical power systems. Measurements of the characteristics of newer devices to generate

electricity. Fault analysis on electrical machines. Prerequisite or concurrent registration: EE 31. (Fall—day and evening) (Harrington)

168 **Microwave and Laser Engineering Laboratory** (1)
Experiments in support of analysis and design of transmission lines, microwave components, microwave systems, fiber-optic systems, antennas and antenna arrays. Introduction to the characteristics of laser and optical systems. Prerequisite: EE 32, 67; prerequisite or concurrent registration: EE 133, 143. (Fall—day and evening) (Kahn)

169 **Advanced Electronics Design Laboratory** (1)
Experiments in support of the theory of the analog operation of electronic devices. Characteristics of nonlinear operation of electronic devices. Use of electronic devices in communication equipment. May be taken for graduate credit by graduate students who are not majoring in energy conversion, power, and transmission. Prerequisite: EE 32, 67; prerequisite or concurrent registration: EE 121, 143. (Fall—day and evening) (Heller)

172 **Control Systems Design** (3)
Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114, EE 12 or ME 134. (Spring—day and evening) (Carroll)

176 **Control Systems Laboratory** (1)
Experiments in support of control theory. Characteristics of control components. Control components in feedback systems. Effects of nonlinearity on control systems. Prerequisite or concurrent registration: EE 172. (Spring—day and evening) (Carroll)

177 **Electrical Energy Conversion** (3)
Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase AC rotating machines, DC machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Fall and Spring—day; Spring, even years—evening) (Harrington)

178 **Electrical Power Systems** (3)
Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis by digital computer. Load-flow studies, economic considerations. Power station designs and synchronization of generators. Methods of generating electrical power. May be taken for graduate credit. Prerequisite: EE 177, senior status. (Fall—evening) (Harrington)

184 **Medical Engineering Instrumentation and Systems Design** (3)
Introduction to the applications of engineering design in the medical sciences: terminology of the medical profession, physiology of the human body, from overall systems or functional approach, survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit except by medical engineering majors. (Spring—evening) (Eisenberg)

186 **Medical Engineering Laboratory** (1)
Experiments in support of instrumentation used in medicine and biology. safety considerations. Acquisition and measurement of physiological signals. EKG, EEG, evoked potentials. Processing of signals derived from physiological measurements. Concepts in telemetry of medical signals. Prerequisite or concurrent registration: EE 12, 32, 66, 121, 184. (Spring—day and evening) (Loew)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Computer Science Undergraduate Study

The Department of Electrical Engineering and Computer Science offers a program of study leading to the degree of Bachelor of Science with a major field in computer science.

Computer science is the study of the computer—its present or potential physical attributes, or hardware, and the methods of its use, or software. The undergraduate curriculum combines systems design, computer programming, and mathematics into a comprehensive area. The student who completes the program will be able to design the hardware and software needed for both large systems and small microprocessor-based computing systems. The curriculum prepares the student for graduate school, for careers in computer or software design, or for applications of computers. The program gives the student the broad background in the fundamentals of computer science necessary to conceive and perceive future improvements in this area.

Widespread use of the digital computer has caused great changes in virtually every area of human endeavor involving data generation, collection, analysis, reduction, and display. Business, economic, legal, educational, scientific, military, political, and humanitarian organizations all have benefited in some way by using computers. Careers are available in every area related to computer science, including designing, testing, operating, installing, programming, maintaining, instructing, and buying and selling computers and related equipment. Faculty members in the Department have research interests that include time-sharing systems, information systems, associative memories and processors, simulation, artificial intelligence, robotics, programming languages, automata theory, interactive computer graphics, human factors of the man–machine interface, microprocessors, distributed processing and networking, fault-tolerant design, security and privacy, correctness of programs, analysis of algorithms, database systems, cartography, and spectral analysis.

Well-qualified undergraduate students may participate in faculty research through the Honors Research Program. Students admitted to that program are assigned to selected computer science faculty for academic advising and guidance. They are afforded the opportunity to participate in specially designed research projects and in related seminars.

In addition, a limited number of undergraduate students may participate in research by becoming Research Assistants. Summer employment as an assistant to a faculty member conducting research may be available.

Computer Science Subject Area

CSci 10 Word Processing, Filing, and Spread Sheet Systems
CSci 30 Introduction to Computing
CSci 51 Applications of Computers
CSci 52: Computers and Societal Problems
CSci 55: Introductory Computer Programming
CSci 100 Introduction to Computer Science
CSci 150: Introduction to Microcomputers
CSci 151: Introduction to Systems Programming I
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Systems Programming II

CSci 157: Machine and Assembly Language Programming
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 171: Computational Methods for Simulation
CSci 177: Programming for Management Systems
CSci 178: Introduction to Database Management
CSci 185: Introduction to Computer Graphics

Computer Science Laboratories

EE 63: Instrumentation and Networks Laboratory
EE 65: Introductory Electronics Laboratory
CSci 66: Digital Electronics Design Laboratory
CSci 67: Switching Circuits Laboratory
CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
CSci 166: Computer Science Laboratory I
CSci 167: Computer Science Laboratory II

Computer Science Curriculum

First Semester

Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
CSci 55: Introductory Computer Programming (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

Math 32: Single-Variable Calculus II (3)
Chem 13: General Chemistry (4)
Phys 14: Mechanics and Thermal Physics (3)
CSci 158: Algorithmic Methods and High-Level Languages (3)
Elective: Selected from humanities or social sciences (3)

Third Semester

ApSc 113: Engineering Analysis I (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
CSci 161: Discrete Structures for Computing (3)
Elective: Selected from humanities or social science (3)

Fourth Semester

ApSc 114: Engineering Analysis II (3)
ApSc 115: Engineering Analysis III (3)
EE 11: Linear Networks I (3)

Phys 16: Modern Physics (3)
CSci 157: Machine and Assembly Language Programming (3)
CSci 159: Programming and Data Structures (3)

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
CSci 153: Design of Switching Systems (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 177: Programming for Management Systems (3)

Sixth Semester

EE 122: Pulse and Waveshaping Electronic Design (3)
CSci 66: Digital Electronics Design Laboratory (1)
CSci 67: Switching Circuits Laboratory (1)
CSci 150: Introduction of Microcomputers (3)
CSci 178: Introduction to Database Management (3)
Electives: Selected from humanities or social sciences (6)

Seventh Semester

CSci 151: Introduction to Systems Programming I (3)
CSci 154: Digital Computer Design (3)
CSci 163: Senior Computer Science Project Laboratory I (1)
CSci 166: Computer Science Laboratory I (1)
CSci 185: Introduction to Computer Graphics (3)
Electives: Technical electives (6)

Eighth Semester

CSci 156: Introduction to Systems Programming II (3)
CSci 164: Senior Computer Science Project Laboratory II (1)
CSci 167: Computer Science Laboratory II (1)
CSci 171: Computational Methods for Simulation (3)
Elective: Selected from humanities or social sciences (3)
Electives: Technical electives (6)

Technical Electives

ApSc 199: Honors Research Project and Seminar (3–3)
EE 31: Fields and Waves I (3)
EE 32: Fields and Waves II (3)
EE 113: Network Analysis and Design (3)
EE 121: Engineering Electronics and Design (3)
EE 124: Electronic Devices (3)
EE 143: Elements of Communication Engineering Design I (3)

EE 144: Elements of Communication Engineering Design II (3)
EE 172: Control Systems Design (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)
EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EAd 170: Basic Quantitative Methods for Engineering Administration (3)
OR 101: Survey of Operations Research Methods I (3)
OR 102: Survey of Operations Research Methods II (3)
OR 151: Linear Programming (3)
Mgt 107: Fundamentals of Behavioral Science (3)
Mgt 120: Information Systems Development I (3)
Mgt 121: Information Systems Development II (3)
Math 101: Introduction to Mathematical Logic (3)
Math 113: Graph Theory (3)
Math 121–22: Introduction to Abstract Algebra (3–3)
Math 123: Linear Algebra (3)
Math 124: Introduction to Matrix Theory (3)
ApSc 57: Analytical Mechanics I (2)
ApSc 58: Analytical Mechanics II (3)
ApSc 116: Engineering Analysis IV (3)
ME 131: Thermodynamics (3)
ME 187: Heat Transfer Theory (3)
ME 194: Energy Conversion (3)
CE 140: Materials Science (3)
CE 190: Contracts and Specifications (2)

Computer Science Undergraduate Courses

The faculty member whose name appears at the end of each course description is the course director. He or she is not necessarily the instructor for any given semester.

10 **Word Processing, Filing, and Spread Sheet Systems** (3)
Introduction to the use of a modern microcomputer system. Word-processing systems, such as APPLE WRITER or WORD STAR. Filing systems, such as DB MASTER or PFS. Spread sheet systems, such as VISICALC or SUPERCALC. Construction of word processing, database, and spread sheet files of medium size and processing on microcomputers. May not be counted toward degree requirements for EE/CSci majors. (Fall and Spring) (Maurer)

30 **Introduction to Computing** (3)
For students whose majors are not electrical engineering or computer science. Survey of computers and languages, communicating with a computer; introduction to BASIC; obtaining output from a computer; history of computing; positions in the computing industry; the effect of computers on our lives; uses for computers. Prerequisite: Algebra. (Fall and Spring) (Hoffman)

51 **Applications of Computers** (3)
For students whose majors are not electrical engineering or computer science. Introduction to the solution of problems on a digital computer using FORTRAN; data processing concepts and numerical methods using batch or interactive time-shared terminal computer systems, writing, debugging, and running programs on various digital computer systems. (Graduate students seeking a first course in computing should enroll in CSci 100.) (Fall and Spring—day and evening) (Feldman)

52 **Computers and Societal Problems** (3)
Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Soft-

ware methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTRAN or BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci 51 or equivalent; two years of college-preparatory mathematics. (Fall and Spring—day and evening) (Bock)

55 **Introductory Computer Programming** (3)
Introduction to programming of a digital computer using BASIC. Algorithmic development and structured programming techniques. Documentation of programs. For electrical engineering, computer science, and operations research and computational science majors. (Fall—day and evening; Spring—evening) (Feldman)

66 **Digital Electronics Design Laboratory** (1) (Same as EE 66)
Characteristics of electronic devices used in switching, sweeping, and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Prerequisite: EE 65; prerequisite or concurrent registration: EE 122. (Spring—day and evening; Fall—evening) (Rohlfs)

67 **Switching Circuits Laboratory** (1) (Same as EE 67)
Analysis and design of combinational and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators, and arithmetic circuits. Prerequisite or concurrent registration: EE 66, 153. (Spring—day and evening; Fall—evening) (Rohlfs)

100 **Introduction to Computer Science** (3)
More intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN or BASIC; data processing concepts, numerical and nonnumerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Fall and Spring—evening) (Feldman)

150 **Introduction to Microcomputers** (3)
Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information, and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmetic operations. Different microcomputer architectures. Prerequisite: CSci 153, 157, or permission of course director. (Fall and Spring—day and evening) (Abd Alla)

151 **Introduction to Systems Programming I** (3)
Concepts and use of macro-assemblers and conditional assembly. Control of I/O via access methods. Job control languages and file structures. File and storage management. Use of linkers and loaders to create load modules. Prerequisite: CSci 157, 159. (Fall—day and evening) (Feldman)

153 **Design of Switching Systems** (3)
Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous, and pulse sequential circuits. State assignment and covers. May be taken for graduate credit except by majors in computer science or simulation and numerical methods. (Fall and Spring—day and evening) (Friedman)

154 **Digital Computer Design** (3)
Logic and electronic design of functional digital units. Design of: digital computer subsystems, flow of information and logical flow diagrams in timing and control signals, binary and decimal, serial and parallel digital arithmetic units; memory subsystems, channels, I/O, and storage subsystems, the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci 153, 157. (Fall and Spring—day and evening) (Abd Alla)

155 **Introduction to Numerical Methods for Computers** (3)
Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; or a course in high-level computing. (Fall—day and evening) (Meltzer)

156 **Introduction to Systems Programming II** (3)
Concepts of an operating system, monitors, dispatchers, initiators, and control programs. Control of task, job stream, and secondary storage. Memory management, interrupt handling, device management, and scheduling algorithms. Concurrent processes. Performance evaluation in a multiprogrammed environment. Prerequisite: CSci 151. (Spring—day, Spring, even years—evening) (Hoffman)

157 **Machine and Assembly Language Programming** (3)
Programming of microcomputers, minicomputers, and large-scale computers in machine and assembly language. Number systems and codes. Architecture of various digital computers. Methods of addressing and machine control for fixed- and variable-word-length computers. Programming on a stack architecture computer. Input–output control. Timing and benchmarking techniques. Prerequisite: CSci 30, 51, or 55. May be taken for graduate credit by graduate students who are not majoring in computer science or simulation and numerical methods. (Fall—day and evening, Spring—evening) (Bock)

158 **Algorithmic Methods** (3)
Structure and application of high-level programming languages. Structured programming and nonnumeric algorithmic development. Introduction to parsing, grammars, compiling, and BNF. Team programming techniques, program development languages, and documentation. PASCAL is utilized. Designed for majors in computer science. May be taken for graduate credit. Prerequisite: CSci 55. (Fall and Spring—day and evening) (Bock)

159 **Programming and Data Structures** (3)
Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings, and linked structures. Sorting, searching, hashing, and merging of data files. List and string processing languages. Prerequisite: CSci 201, or 157 and 158. May be taken for graduate credit. (Spring—day and evening) (Feldman)

161 **Discrete Structures for Computing** (3)
Introduction to discrete mathematical structures that form the basis for computing. Sets, graphs, functions, mappings, lattice, groups and semigroups, combinational problems, and enumeration. Finite-state machines, representation, identification, transitions, and reduction. Directed graphs, trees, and paths. Regular expressions and Turing machines. Prerequisite: CSci 158, Math 33. (Fall—day and evening) (Maurer)

163 **Senior Computer Science Project Laboratory I** (1)
Conception and design of a one-year project in hardware and or software to be completed in CSci 164. Performance of a market survey and economic

analysis of the product. Completion of the preliminary design. Prerequisite: EE 122, CSci 66, 67, 150, 178, senior status. (Fall—day and evening) (Abd Alla)

164 **Senior Computer Science Project Laboratory II** (1)
Completion and construction of the project started in CSci 163. Oral and written presentation of the product designed. Prerequisite: CSci 163. (Spring—day and evening) (Abd Alla)

166 **Computer Science Laboratory I** (1)
Experiments in support of the theory and design of microprocessor and microcomputer hardware and software. Use of microprocessors in control of systems. Use of simulators, cross-compilers, and development systems. Prerequisite or concurrent registration: EE 63, 65, 122; CSci 66, 67, 150, 157. (Fall—day and evening) (Abd Alla)

167 **Computer Science Laboratory II** (1)
Experiments in support of the design of digital computing systems. Design of memory, control, and arithmetic units. Input and output in a computer. Software experiments to support the operating system for a small computer. Prerequisite or concurrent registration: CSci 154, 156, 166. (Spring—day and evening) (Abd Alla)

171 **Computational Methods for Simulation** (3)
Computational methods for continuous and discrete system simulation using both digital and analog computers. Effects of computer software and hardware architectures on computational precision and accuracy requirements. Random number generation and testing. Calibration and scaling technique. Verification and validation technique. Class project: applications to games for small microcomputers. Graphics interfacing. Analysis of case studies. Prerequisite: ApSc 113, 115, CSci 155, 159. (Spring–day and evening) (Bock)

177 **Programming for Management Systems** (3)
Intermediate programming course with application in business and government commercial programming. Emphasis on programming for accounting and management information systems. Use of file editing, report generation, and tapes. COBOL is utilized. Prerequisite: CSci 158. (Fall—day and evening) (Bock)

178 **Introduction to Database Management** (3)
Concepts in database systems; inverted file structure; query formulation and language; data structure to minimize access time; construction of a database management system; survey of some existing database management systems. Prerequisite: CSci 158, 159. (Spring—day and evening) (Berkovich)

185 **Introduction to Computer Graphics** (3)
Architecture of interactive display devices and connectivity to a computer. Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping, and transformations. Raster graphics concepts. Hidden-line algorithms. Shading and texture techniques. Prerequisite: CSci 178. (Fall—day and evening) (Sibert)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

Graduate Study

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of maturity and basic knowledge one of the most stimulating experiences for advanced study. The Department offers study

leading to the Master of Science, Professional, and Doctor of Science degrees. The student may study in the following areas of concentration: systems science, networks, and controls; electrophysics (electronics, fields, and waves); communications; medical engineering; computer science (hardware, software, and systems); simulation and numerical methods; energy conversion, power, and transmission; or telecommunications and computers.

The graduate programs are formulated to take into consideration the student's individual strengths, skills, aspirations, and abilities and are determined through consultation with the faculty adviser. The program should provide the student with thorough understanding of the area of concentration and with the breadth of knowledge necessary in modern engineering and computer science. Each graduate student is assigned a faculty adviser on the basis of study interests, helping to develop a close student–faculty relationship during the course of the program.

Colloquium Requirement: Graduate students are required to attend several Department colloquia each semester. These are intended to broaden the student's professional outlook and to encourage interaction with the faculty. Schedules are posted.

The graduate programs are also designed to provide an educational service to the Washington technical community. Many courses have been developed after consultation with private industry and government agencies in the area. A substantial number are offered during both the afternoon and the evening and alternate from year to year.

The Department has continuously kept the graduate program up to date through contact with recent developments, research generated within the Department, and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The Department periodically publishes a detailed brochure to supplement the present catalogue with information about procedures, requirements, regulations, and scope of its graduate programs. Special pamphlets describing specific programs are also available.

Areas of Concentration

Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

Communications

EE 204: Stochastic Signals and Noise
EE 205 Stochastic Processes in Electrical Engineering
EE 208: Digital Image Processing
EE 241: Information Theory
EE 242: Coding Theory
EE 243: Communications Theory I
EE 244: Communications Theory II
EE 245 Signal Detection and Estimation Theory
EE 246: Digital Communications
*EE 247: Communications Systems
EE 248: Data Communications Systems
EE 249: Theory of Data- and Computer-Communications Networks
EE 252: Digital Signal Processing Techniques
EE 253: Sonar Systems
EE 254: Radar Systems
EE 257: Secure Communications

*EE 258: Radio Communications Systems I
*EE 259: Radio Communications Systems II
*EE 277 Satellite Communications Systems
EE 298: Research
EE 299–300: Thesis Research
*EE 345: Advanced Detection Theory
*EE 346: Communications Switching and Traffic Theory
EE 347: Data Communications
EE 349: Communications Research
EE 399: Dissertation Research

Computer Science (Hardware, Software, and Systems)

CSci 154: Digital Computer Design
CSci 158 Algorithmic Methods and High-Level Languages
CSci 159 Programming and Data Structures
CSci 201 Introduction to Computer Systems
CSci 203 Microprocessors and Microcomputers
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 215: Advanced Data Structures
CSci 216 Information Retrieval Systems
CSci 219 Interactive Computer Graphics I
CSci 222 Design of User–Computer Dialogues
CSci 227 Management Information Systems and Database Management
CSci 229 Security and Privacy in Computer Systems
CSci 231: Sequential Machines
CSci 232 Automata and Formal Languages
CSci 237: Computing Systems
*CSci 239: Comparative Computer Systems
*CSci 240 Theory and Practice of Microprogramming
CSci 243 Fault Tolerant Systems and Design Automation
CSci 244: Data Communications
*CSci 245 Advanced Computer Systems Theory I
*CSci 246: Advanced Computer Systems Theory II
*CSci 255 Analysis and Correctness of Algorithms
*CSci 256 Design of Translators
*CSci 258 Advanced Programming Languages
CSci 263 Digital Computer Programming Systems
*CSci 267: Operating Systems I
*CSci 268: Operating Systems II
CSci 298: Research
CSci 299–300: Thesis Research
*CSci 319 Interactive Computer Graphics II
CSci 391: Computer Science Research
CSci 399: Dissertation Research

Electrophysics (Electronics, Fields, and Waves)

EE 201 Natural Modes and Transients in Electrical Systems
EE 206 Electromagnetic Theory and Applications I
EE 207 Electromagnetic Theory and Applications II
EE 221 Physical Electronics I
EE 222: Physical Electronics II
EE 223: Optical Communications Systems
*EE 224: Electronics of Lasers
EE 225: Nonlinear Electronics

*EE 226: Fiber and Integrated Optics
EE 227: Industrial Electronics
EE 228: High-Frequency Electronics
EE 231: Field Analysis and Potential Theory
*EE 232: Electrodynamics
EE 233: Microwaves and Components
*EE 234: Electromagnetic Wave Propagation
EE 235: Antennas
*EE 236: Plasma Dynamics
*EE 237: Waves in Random Media
EE 238: Remote Sensing
EE 239: Numerical Laboratory in Electromagnetics
EE 255: Optical Processing
EE 298: Research
EE 299–300: Thesis Research
*EE 321: Approximate Mathematical Techniques for Electromagnetics
*EE 322: Advanced Waveguide Diffraction and Design
*EE 323: Principles of Microelectronics
*EE 329: Electrophysics Research
EE 399: Dissertation Research

Energy Conversion, Power, and Transmission

EE 202: Linear System Theory I
EE 206: Electromagnetic Theory and Applications I
*EE 261: Electromechanical Energy Conversion
*EE 262: Control of Rotating Machinery
EE 263: Design of Reliable Emergency and Standby Power Systems
*EE 264: Direct Electrical Energy Conversion
EE 265: Transients in Electrical Power Systems
EE 266: Electrical Power Transmission
EE 267: Power Networks
EE 268: Electrical Power Distribution
EE 269: Overall Electrical Power Generation Plant Design
*EE 298: Research
EE 368: High-Voltage Testing Techniques for Electrical Apparatus
EE 369: Issues in Electrical Power Systems
EE 399: Dissertation Research

Medical Engineering

EE 280: Introduction to Medicine for Engineers I: Physiology and Anatomy
EE 281: Introduction to Medicine for Engineers II: Physiology and Anatomy
EE 282: Medical Instrumentation I
EE 283: Medical Instrumentation II
EE 285: Sensory-Evoked Potentials I
EE 287: Engineering in Physical Medicine and Rehabilitation
*EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
*EE 380: Bioelectric Phenomena
*EE 381: Computer-Aided Analysis of Physiological Signals
*EE 382: Physiological Controls and Systems
*EE 384: Medical Imaging
*EE 385: Sensory-Evoked Potentials II
EE 389: Medical Engineering Research
EE 399: Dissertation Research

Simulation and Numerical Methods

EE 202: Linear System Theory
EE 203: Graph Theory and Applications
EE 252: Digital Signal Processing
EE 272: Discrete Systems
EE 276: Cybernetics
*EE 371: Simulation Methods for Systems Analysis
CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems I
*CSci 220: Pattern Recognition
CSci 221: Simulation and Heuristics
*CSci 223: Computational Heuristics
*CSci 224: Artificial Intelligence
*CSci 226: Robotics
*CSci 278: Analog and Hybrid Computers
CSci 281: Applications of Numerical Methods I
CSci 282: Applications of Numerical Methods II
*CSci 286: Numerical Methods in Engineering I
*CSci 287: Numerical Methods in Engineering II
*CSci 288: Numerical Methods in Engineering III
*CSci 289: Numerical Methods in Engineering IV
CSci 298: Research
CSci 299–300: Thesis Research
CSci 399: Dissertation Research

Systems Science, Networks, and Controls

EE 202: Linear Systems Theory
EE 203: Graph Theory
EE 204: Stochastic Signals and Noise
EE 212: Network Analysis
*EE 213: Computer-Aided Analysis and Design of Systems
EE 215: Network Synthesis
*EE 216: Synthesis of Active and Distributed Networks
*EE 217: Advanced Network Theory
*CSci 220: Pattern Recognition
*EE 271: Linear Multivariable Control Theory
EE 272: Computer Control Systems
EE 273: Systems Optimization
*EE 274: Nonlinear Systems
*EE 275: System Identification and Adaptive Control Systems
*EE 279: Stochastic Control Theory
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks, and Control Research
*EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research

Telecommunications and Computers

EE 144: Elements of Communication Engineering Design II
EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II

EE 246: Digital Communications
EE 248: Data Communications Systems
EE 249: Theory of Data- and Computer-Communications Networks
EE 257: Secure Communications
EE 346: Communications Switching and Traffic Theory
EE 348: Data Communications
CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems
CSci 216: Information Retrieval Systems
CSci 227: Management Information Systems and Database Management
CSci 229: Security and Privacy in Computer Systems
CSci 244: Data Communications
CSci 263: Digital Computer Programming Systems
CSci 267: Operating Systems I
CSci 268: Operating Systems II
EAd 211-12: Engineering Administration
EAd 261: Economic Analysis in Engineering Planning
EAd 262: Finance for Engineers
EAd 269: Elements of Decision Making and Problem Solving
EAd 281: Systems Analysis and Management I
EAd 292: Structural Analysis of Management Problems
OR 251: Linear Programming

Master of Science Degree Program

The Department of Electrical Engineering and Computer Science offers graduate study leading to the degree of Master of Science in the following areas of concentration. Faculty members who may serve as advisers are listed after each area.

Communications (Braun, Chang, Helgert, Heller, Lang, Pickholtz)

Computer Science (Hardware, Software, and Systems) (Abd Alla, Berkovich, Bock, Della Torre, Feldman, Foley, Friedman, Hoffman, Maurer, Meltzer, Sibert, Zaghloul)

Electrophysics (Electronics, Fields, and Waves) (Braun, Eisenberg, Heller, Kahn, Lang)

Energy Conversion, Power, and Transmission (Harrington, Kahn, Lang, Meltzer)

Medical Engineering (Cheung, Eisenberg, Loew)

Simulation and Numerical Methods (Abd Alla, Bock, Carroll, Della Torre, Feldman, Foley, Hoffman, Loew, Maurer, Meltzer, Zaghloul)

Systems Science, Networks, and Controls (Carroll, Kyriakopoulos, Lee, Loew, Meltzer, Zaghloul)

Telecommunications and Computers [Chang, Helgert, Hoffman, Meltzer, Pickholtz; Shane, Steiner (Engineering Administration)]

There are no required courses or programs of study in any of the areas of concentration. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the general requirements, the applicants must have satisfied the requirements for admission to graduate study (see pages 28–29). Admission to graduate study toward a master's degree requires an appropriate bachelor's degree (one in engineering technology is normally not sufficient) from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by grades, Graduate Record Aptitude Test scores, and

similar data. Students are encouraged to submit Graduate Record Examination scores; candidates who do submit such scores will be given preference in consideration for research and teaching fellowships. The transfer of credit regulations (see page 29) apply as well to courses taken as a nondegree student through the Division of Continuing Education and Summer Sessions at George Washington University.

General Requirements

The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science; must have at least a quality-point index of 2.70 (on a scale with 4.00 maximum), or equivalent, for the last 60 semester hours of undergraduate work; and must be adequately prepared in the basic sciences (physics; chemistry or biology) and in mathematics (four semesters beyond precalculus).

Specific Requirements

In addition to the general requirements, the applicant must have satisfied through undergraduate studies the following specific requirements according to the area of concentration:

Communications

1. Networks with applications using Laplace transforms (6 semester hours—EE 11, 12; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Communication theory (3 semester hours—EE 143; or equivalent)

Computer Science

1. Computer programming using FORTRAN (3 semester hours—CSci 100; or equivalent)
2. Computer hardware and software (6 semester hours—CSci 153, 157; or equivalent)

Electrophysics

1. Networks with applications using Laplace transforms (6 semester hours—EE 11, 12; or equivalent)
2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20, 121; or equivalent)
3. Fields and waves (6 semester hours—EE 31, 32; or equivalent)

Energy Conversion, Power, and Transmission

1. Network analysis using Laplace transforms (6 semester hours—EE 11, 12; or equivalent)
2. Fields and waves (6 semester hours—EE 31, 32; or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177; or equivalent)

Medical Engineering

Either:

1. Network theory (3 semester hours—EE 11; or equivalent)
2. Electronic circuits (6 semester hours—EE 20, 121; or equivalent)

Or:

1. Computer programming (3 semester hours—CSci 100; or equivalent)
2. Computer hardware and software (6 semester hours—CSci 153, 157; or equivalent)

Simulation and Numerical Methods

1. Computer programming using FORTRAN (6 semester hours—CSci 100, 157; or equivalent)
2. Mathematics including partial differential equations, matrices, and eigenvalue problems
3. Probability and statistics (3 semester hours—ApSc 115; or equivalent)

Systems Science, Networks, and Controls

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, 113; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Control theory (3 semester hours—EE 172; or equivalent)

Telecommunications and Computers

1. Communication theory (3 semester hours—EE 143; or equivalent)
2. Computer science (6 semester hours—CSci 100, either 150 or 157; or equivalent)

In cases in which some undergraduate deficiencies exist, the student may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a graduate student.

Program of Study

Upon admission to the Master of Science degree program, the graduate student is assigned a faculty adviser. In consultation the student and faculty adviser formulate the program of study and complete the Graduate Program of Studies (Form 1) for submission to the Department Chairman for approval. This form should be completed prior to or at the student's first registration. During consultation the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree consists of a minimum of 24 semester hours of graduate-level courses and 6 semester hours of thesis or, for the nonthesis option, a minimum of 33 semester hours of graduate-level courses. For the thesis option, a minimum of 12 semester hours must be in the major field of concentration and no less than three graduate-level courses must be in areas other than the student's area of concentration (the major). For the nonthesis option, a minimum of 21 semester hours must be in the major field and no less than three courses must be in areas other than the student's major area. In the case of an interdisciplinary program, no courses outside the major are required but an approximately equal division of courses between or among the disciplines is required.

A maximum of three courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year. On the prescribed form and prior to the deadline, students must notify the Department of their intent to take the

examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day. The student is asked to solve several problems relating to the subject matter of his or her major area of study; the student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is not limited to those specific courses that the student has taken but is designed to demonstrate the student's ability to integrate material from several course areas and to learn from the readings.

A student who fails the Master's Comprehensive Examination on the first attempt may, in exceptional circumstances, be reexamined one more time if approval is given by the appropriate examining committee and the department. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

Professional Degree Program

The Department of Electrical Engineering and Computer Science offers graduate study leading to a professional degree. This program is for students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material, rather than on research. Successful completion of the professional degree program leads to the degree of Engineer or Applied Scientist. Students may study for the professional degree in the following areas of concentration: communications; computer science (hardware, software, and systems); electrophysics (electronics, fields, and waves); medical engineering; systems science, networks, and controls; energy conversion, power, and transmission; and simulation and numerical methods.

There are no formal required courses or programs of study in any of the areas of concentration for the professional degree. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward a professional degree (see pages 34–35), applicants for the professional degree programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

General Requirements

The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science; must have a quality-point index of at least 3.0 (on a scale of 4.0 maximum) and two years of professional experience after obtaining the master's degree; and must be adequately prepared in the basic sciences (physics, and chemistry or biology) and in mathematics (calculus through differential equations).

Specific Requirements

In addition to the general requirements, the applicant must have satisfied through previous studies the following specific requirements according to the area of concentration:

Communications

Nine semester hours of statistical theory of communications and 3 semester hours of information theory—EE 204, 241, 243, 244; or equivalent.

Computer Science

Fifteen semester hours of computer system design and software beyond the use of a compiler language—CSci 153, 154, 159, 201, 213; or equivalent.

Electrophysics

Twelve semester hours of physical electronics and electromagnetics at the graduate level—EE 201, 206, 207, 221; or equivalent.

Energy Conversion, Power, and Transmission

Twelve semester hours of electrical machine theory and networks at the graduate level—EE 261, 262, 264, 266; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 280, 281, 282, 283; or equivalent.

Simulation and Numerical Methods

Twelve semester hours of computer science and numerical methods at the graduate level—CSci 159, 201, 221, 281; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours of network system analysis at the graduate level, including a knowledge of state-space and linear graph theory—EE 202, 204, 212, 272, 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study that is increased beyond the minimum requirements so that sufficient background material may be covered.

Program of Study

Upon admission to the professional degree program, the student is assigned a faculty adviser. Together they formulate a program of study for the student that must contain a minimum of 30 semester hours of courses and complete the Graduate Program of Studies form. Programs of study and any subsequent changes must be approved by both the faculty adviser and the Department Chairman.

The program of study for the professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major area in support of the student's program. A student who is changing the major area from that studied for the master's degree or who is lacking the specific requirements needed for admission may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

Doctor of Science Program

The Department of Electrical Engineering and Computer Science offers programs of graduate study leading to the degree of Doctor of Science in the areas of concentration given under *Specific Requirements*. There are no formal

required courses or programs of study in the areas listed. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser.

Special fields of each faculty member are listed below.

Abd Alla, A.—Professor of Engineering and Applied Science
Digital Computer Systems; Time-Sharing Systems; Logical Design of Switching Circuits; Microprocessors

Berkovich, S.—Associate Professor of Engineering and Applied Science
Information Systems; Data Structures; Associative Memories and Processors

Bock, P.—Associate Professor of Engineering
Computer Science; Simulation; Programming Languages; Microprocessor Systems; Artificial Intelligence; Robotics

Braun, E.H.—Associate Professor of Engineering and Applied Science
Antenna Theory; Coding Theory; Physical Electronics

Carroll, R.L.—Associate Professor of Engineering and Applied Science
Control Theory; Adaptive Systems

Chang, S.-C.—Assistant Professor of Engineering
Error Correcting Codes; Logic Design; Communication Theory and Systems

Cheung, A.Y.—Visiting Associate Professor of Engineering
Medical Engineering; Bioelectromagnetics; Industrial and Medical Applications of Electromagnetic Energy

Della Torre, E.—Professor of Engineering and Applied Science
Numerical Device Modeling; Bubble Memory and VSLI Components; Magnetic Phenomena

Eisenberg, M.F.—Professor of Engineering and Applied Science
Medical Engineering; Thermography; Evoked Response; Ultrasonics

Feldman, M.B.—Associate Professor of Engineering and Applied Science
Computer Science; Programming Languages; Data Structures; Information Display Systems; Computer Graphics; Automata Theory

Foley, J.D.—Professor of Engineering and Applied Science
Interactive Computer Graphics; System Modeling and Measurement; Human Factors of the Man–Machine Interface; Distributed Processing and Networking

Friedman, A.D.—Professor of Engineering and Applied Science
Computer Architecture and Organization; Switching Theory and Logic Design; Microprocessors; Diagnosis and Fault Tolerant Design of Digital Circuits; Digital System Design Automation

Harrington, R.J.—Associate Professor of Engineering
Simulation and Control of Electrical Machinery and Power Systems; Transient Stability; Transmission Line Switching Transients; Computer Modeling

Helgert, H.—Professor of Engineering and Applied Science
Communication and Information Theory; Coding Theory

Heller, R.B.—Professor of Engineering and Applied Science
Information Processing; Computer-to-Computer Communications Networks; Satellite Communications; Electromagnetic Radiation

Hoffman, L.J.—Associate Professor of Engineering and Applied Science
Computer Science; Security and Privacy; Criminal Justice Information Systems; Social Implications

Kahn, W.K.—Professor of Engineering and Applied Science
Antennas; Microwave Components; Fiber Optics; Electrophysics
Kyriakopoulos, N.—Associate Professor of Engineering and Applied Science
Computer-Aided Network Design; System Theory; Control Theory; Digital Filtering
Lang, R.H.—Professor of Engineering and Applied Science
Wave Propagation in Random Media; Remote Sensing; Phase-Locked Loops; Adaptive Arrays
Lee, T.N.—Professor of Engineering and Applied Science
Networks; Linear Systems
Loew, M.H.—Associate Professor of Engineering
Pattern Recognition; Medical Engineering; Image Processing
Maurer, W.D.—Professor of Engineering and Applied Science
Computer Science; Correctness of Programs; Analysis of Algorithms; Semantics of Programming Languages
Meltzer, A.C.—Professor of Engineering and Applied Science
Design of Computer Systems; Database Systems; Multiprocessor Systems; Hybrid Computation
Pickholtz, R.L.—Professor of Engineering and Applied Science
Data Communications; Computer Communications Networks; Communications Theory
Rohlfs, D.C.—Associate Professor of Engineering
Specialized Measurements and Instrumentation; Electronic Devices; High-Power HF Systems
Sibert, J.L.—Associate Research Professor of Engineering
Computer Graphics; Cartography; Spatial Analysis
Zaghloul, M.—Assistant Professor of Engineering
Linear and Nonlinear Networks and Systems; Computer-Aided Network Analysis and Design.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward the Doctor of Science degree (see pages 36–37), applicants for the Doctor of Science degree in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

General Requirements

The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science; must have a minimum quality-point index of 3.40 (on a scale of 4.00 maximum), or equivalent, in graduate course work leading to the master's degree; and must be adequately prepared in the basic sciences (physics, and chemistry or biology) and in mathematics (calculus through differential equations).

Language Requirement

Although a knowledge of a foreign language is often advantageous in pursuing graduate study, there is no requirement of any kind regarding a foreign language in the Doctor of Science program of Electrical Engineering and Computer Science.

Specific Requirements

In addition to the above general requirements, the applicant must also satisfy through previous studies the following specific requirements according to the area of concentration (major area):

Communications

Nine semester hours of statistical theory of communications and 3 semester hours of information theory—EE 204, 241, 243, 244; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond the use of a compiler language—CSci 154, 159, 201, 213; or equivalent.

Electrophysics

Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level—EE 201, 206, 207, 221; or equivalent.

Energy Conversion, Power, and Transmission

Twelve semester hours of electrical machines theory and networks at the graduate level—EE 261, 262, 264, 266.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 280, 281, 282, 283; or equivalent.

Simulation and Numerical Methods

Twelve semester hours of numerical methods at the graduate level—CSci 159, 201, 221, 281; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours in network system analysis at the graduate level, including a knowledge of state-space and linear graph theory—EE 202, 204, 212, 272, 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study that is increased beyond the minimum requirements so that sufficient background material may be covered for doctoral studies.

Program of Study

At the time of admission, the graduate student pursuing a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser, during the first semester the student will determine the two minor areas of study. Together they will formulate a program of study for the student, leading to the Qualifying Examination and complete the Graduate Program of Studies form (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and Department Chairman.

Major Area

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas totaling a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the master's degree level. A minimum of 15 semester hours must be taken in the major area; a minimum of three courses designated with an asterisk in the list of

areas of concentration must be included as part of the major area. A student who is changing the major area from that studied for the master's degree or who is missing specific admission requirements may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

Minor Areas

The student, in consultation with the faculty adviser, formulates a program of study that includes two minor areas as part of the total doctoral studies. For those students who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses represent adequate programs in each minor area:

Communications—EE 204, 205 or 241, 243, and 244 or 249
Computer Science—CSci 201, 213, and 237 or 263
Electrophysics—EE 201, 206, 207, 221
Energy Conversion, Power, and Transmission—EE 261, 262, 264, 266
Medical Engineering—EE 280, 281, 282, 283
Simulation and Numerical Methods—CSci 201, 221, 281; or CSci 201, 221, 224
Systems Science, Networks, and Controls—EE 202, 212, 272, 273

Minor areas are not confined to the Department of Electrical Engineering and Computer Science but may be taken from other departments within the University such as Mathematics, Statistics, Operations Research, and Physics. Normally a minimum of three graduate-level courses constitutes a minor area.

Qualifying Examination

The qualifying examination for doctoral students in the Department is composed of two parts. All incoming doctoral students must take the first examination within three regular semesters of the date of formal admission into the doctoral program. Students entering as unclassified students with prescribed deficiencies must take the first examination within five semesters of their entrance as unclassified students. This first examination is the Department's Master's Comprehensive Examination (MCE) in the major area. The student must demonstrate superior performance to qualify formally as a student in the Department at the doctoral level. The requirement to take this first examination is waived for a student who has received an M.S. degree from this department and, within two years prior to entrance, has demonstrated superior performance on the MCE. A student who fails to demonstrate superior performance must take the examination again in one of the two immediately succeeding semesters. A student may take the MCE only two times. Failure to show superior performance twice on the MCE in the major field will result in termination of the student's candidacy.

Upon completion of the student's formal program of study and after demonstrating superior performance on the MCE, the student is prepared to complete the qualifying examination. The purpose of this second part of the qualifying examination is to ascertain that the student's depth and breadth of background and intellectual development are adequate to support doctoral research and investigation in the major area. The second part of the qualifying examination contains three sections, each of one day's duration. One section is a written examination covering only the major area of study, which is given

only in the spring semester each year. The other two sections are written examinations, each covering a minor area of study. Each is given once in the fall semester and once in the spring semester. In addition, an oral examination may be given subsequent to the written examinations. The student must pass the entire second part of the qualifying examination within, at most, two subsequent semesters of the semester in which any section is first attempted. A candidate who fails any section of the examination on the first attempt may take that section one more time, provided approval is given by the examining committee and provided the time limit of three semesters is not exceeded. Failure to pass the qualifying examination will terminate the student's candidacy in the doctoral program.

The questions on the qualifying examination are not limited to those specific areas in which the student has taken course work but are designed to demonstrate the student's ability to integrate the material from several course areas and from individual study and readings. Hence, the student should be familiar with the contemporary work of current journals and the contents of the books on the particular reading lists in the areas of examination, as well as those used in the course work.

Dissertation

After successfully completing the qualifying examination, the student makes arrangements for the assignment of a research director (not necessarily the student's faculty advisor), who selects an appropriate advisory committee. The duties of the advisory committee are to be aware of the student's dissertation development and, in conjunction with the research director, to give guidance to the student. After the student completes the dissertation, the advisory committee becomes the examining committee, with the addition of at least one new person. The dissertation should be of such quality that all or part is suitable for publication in the open literature. Doctoral students are encouraged to publish their work.

Electrical Engineering Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

201 **Natural Modes and Transients in Electrical Systems** (3)
Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z transforms, applications. Prerequisite: graduate status. (Fall and Spring—evening) (Heller)

202 **Linear Systems Theory** (3)
An introduction to linear systems theory. Topics include linear vector spaces and linear operators, mathematical representation of dynamic linear systems, concept of state and solution of the state equation, controllability and observability, canonical forms of the state equation, state feedback, and state estimation. (Spring and Fall) (Zaghloul)

203 **Graph Theory and Applications** (3)
An introduction to oriented and nonoriented graphs. Topics may include graph theory applications to the routing problems of multiple printed

circuits; circuit concepts of linear vector spaces; network analysis and synthesis, topological formulas, paths, reachability, connectedness, tree representations, transportation flows, and communications networks. Computer science applications such as storage representation and manipulation of computer data and other related techniques. (Spring, even years) (Zaghloul)

204 **Stochastic Signals and Noise** (3)
Probability, random variables, characteristic functions; transformations of random variables and applications, sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSc 115 or equivalent. (Fall and Spring—day and evening) (Lang)

205 **Stochastic Processes in Electrical Engineering** (3)
Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth–death process, applications to queuing theory, buffer problems, and the design of communication nets Continuous state processes, diffusion processes, passage times, and estimation problems Estimation and power spectra Stochastic difference and differential equations. Applications to communications theory, control theory, computer science, and propagation theory of random media. Prerequisite: EE 204 or equivalent. (Spring—evening) (Lang)

206 **Electromagnetic Theory and Applications I** (3)
Brief review of vector-phasors and Maxwell equations, electromagnetic potentials, power and energy, plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchoff approximation; elementary applications Prerequisite: EE 133 or equivalent. (Fall—evening) (Lang)

207 **Electromagnetic Theory and Applications II** (3)
Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky wave antennas, ground wave propagation. Prerequisite: EE 201 or equivalent, 206. (Spring—evening) (Lang)

208 **Digital Image Processing** (3)
Properties of images and visual systems. Picture description, sampling and quantization. One- and two-dimensional image transform techniques including Fourier, cosine, and Hadamard Methods of image enhancement and restoration Image coding and data compression techniques Automated image analysis and recognition Computer applications and projects. Prerequisite: EE 204. (Spring—evening) (Loew)

212 **Network Analysis** (3)
Network theorems, functions, and properties; relationship of parts of network functions; realizability and causality concepts Introduction to the theory of nonlinear networks, nonlinear resistive network equation formulation, hybrid and other nonlinear equations Nonlinear dynamic network equation formulation, state space, conditions for existence Concepts of stability in nonlinear networks, conservative and Lagrangian networks and systems. (Fall, odd years) (Zaghloul)

213 **Computer-Aided Analysis and Design of Systems** (3)
Numerical solution of algebraic set of equations, Newton–Raphson and modified Newton–Raphson techniques, solution of algebraic equations with multiple solutions Numerical solution of nonlinear ordinary differential equations, stability, stiff systems, steady-state solution of nonlinear periodically excited networks, computer-aided approach. Numerical optimization techniques, linear and nonlinear programming, gradient methods, uncon-

strained optimization, quasi-Newton methods, and penalty functions. Computer-aided sensitivity analysis of networks. Application in the design of large systems and in automated design. Prerequisite: EE 202 or 212. (Fall, odd years) (Zaghloul)

215 **Linear Network Synthesis I** (3)
Properties and testing of positive real functions. Synthesis of LC, RL, RC one-port networks. Brune, Bott Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of course director. (Fall, even years—evening) (Lee)

216 **Synthesis of Active and Distributed Networks** (3)
Active network synthesis using negative resistors, control sources, NIC, operator, and operational amplifiers. Uniform and nonuniform distributed network analysis and synthesis—computer-aided design. Prerequisite: EE 215. (Spring, odd years) (Lee)

217 **Advanced Network Theory** (3)
Modern methods for formulating network equations; mixed nodal tableau, state-space formulation Mathematical methods for the solution of network equations, properties of nonlinear functions representing the nonlinear networks, losslessness and passivity in nonlinear networks, *n*-port networks. Piecewise linear networks analysis and techniques. Properties of nonlinear dynamic equations; existence and uniqueness of solution; stability and stability classification; Popov, Liapunov, steady-state analysis techniques of nonlinear periodic networks. Other selected topics. Prerequisite: EE 202, 212. (Fall, even years) (Zaghloul)

219 **Digital Filter: Design and Realization** (3)
Properties of transfer functions. Filter approximation, sensitivity, and computation techniques Digital signals and systems, basic block of digital filters, stability consideration. Analysis of digital filters. Design of IIR and FIR digital filters. Computation techniques Direct and indirect realization of digital filters. Microprocessor implementation. Applications and selected papers Prerequisite: EE 202 or permission of course director. (Spring, odd years) (Zaghloul)

221 **Physical Electronics I** (3)
Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics. Prerequisite: EE 207 or equivalent. (Fall—evening) (Braun)

222 **Physical Electronics II** (3)
The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221. (Spring—evening) (Braun)

223 **Optical Communications Systems** (3)
Optical communications channels, survey of laser sources, modulation; line-of-sight links; system models and analysis, detection, photoemitters, photodiodes, and photoconductors, noise mechanisms and signal-to-noise analysis; optical fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optic fiber cabling, repeaters, and systems analysis, integrated optic components. Prerequisite: EE 207, 243. (Spring, odd years—evening) (Kahn)

224 **Electronics of Lasers** (3)
Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms, rate equations Resonators, He-Ne laser; organic dye lasers, injection lasers. Nonlinear interactions in lasers. Prerequisite: EE

222 or equivalent. (Fall 1981 and every third year thereafter—evening) (Kahn)

225 **Nonlinear Electronics** (3)
Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators; study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall, even years—evening) (Heller)

226 **Fiber and Integrated Optics** (3)
Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos–Haenchen shift, Hamiltonian formalism; directional couplers, modulators, and deflectors in fibers and surface films; coupled-mode theory. (Spring, even years—evening) (Kahn)

227 **Industrial Electronics** (3)
Applications of electronic devices in industry; continuous and sampled control systems; induction and dielectric heating; timing and counting circuits; reliability and automatic checking equipment; digital control of machine tools. Prerequisite: EE 201 or equivalent; graduate status. (Fall, odd years—evening) (Heller)

228 **High-Frequency Electronics** (3)
Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communications systems. Prerequisite: EE 207 or equivalent. (Spring, even years) (Heller)

229 **VLSI Systems** (3)
Introduction to MOS, bipolar, optic, magnetic, and other technologies using VLSI techniques. Computer-controlled lithographic techniques for mask making and circuit manufacture. Device processing and yield. Design and optimization of VLSI circuits. Ultimate limitations of the technology. Prerequisite: EE 221, 222. (Fall) (Della Torre)

231 **Field Analysis and Potential Theory** (3)
General study of the theory of potentials as used to facilitate solution of problems in electromagnetic theory, mechanics, thermodynamics, optics, and gravitation. Emphasis on mathematical methods such as Green's functions, variational methods, principal axis transformations, and multidimensional analysis. Fourier transforms. Prerequisite: EE 207. (Spring 1981 and every third year thereafter—evening) (Heller)

232 **Electrodynamics** (3)
Special theory of relativity and the Lorentz transformation; Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring 1982 and every third year thereafter) (Braun)

233 **Microwaves and Components** (3)
High-frequency transmission lines and guided systems; matching techniques; scattering parameters; transfer parameters, directional couplers, cavity resonators; Faraday rotation, ferrite isolators and circulators. Prerequisite: EE 207. (Fall—evening) (Kahn)

234 **Electromagnetic Wave Propagation** (3)
Retarded time scalar, vector, and Hertz potential. Dipole and dipole array fields. Mie theory of electromagnetic scattering by spheres. Propagation in electrically and magnetically anisotropic media such as dielectric crystals, space-charge plasmas, and ferrites. Wave propagation in inhomogeneous media; Liouville transformation, Lagrange's variation of parameters, WKB solution, invariant imbedding techniques. Propagation in stochastic and dispersive media. Prerequisite: EE 207. (Spring, even years—evening) (Lang)

235 **Antennas** (3)
General solution of Maxwell's equations in terms of current sources, polarization, the far field approximations, radiation from current distributions, field equivalence theorems, the geometrical optics approximation, aperture antennas, receiving antennas, the theory of arrays, and applications to specific antennas and antenna types. Prerequisite: EE 207. (Spring, odd years—evening) (Kahn)

236 **Plasma Dynamics** (3)
Study of the interaction of fluids with electromagnetic fields. Generalized Navier–Stokes and energy equations, magnetogasdynamic and magnetohydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized Von Karman–Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207. (Fall 1983 and every third year thereafter) (Braun)

237 **Waves in Random Media** (3)
Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communications channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, even years—evening) (Lang)

238 **Remote Sensing** (3)
Description and analysis of active and passive remote sensing systems including scattermeters, real aperture imaging and synthetic aperture radars. Sensing of surface, subsurface and atmospheric parameters at microwave, infrared and optical frequencies. Analysis of radiometric techniques using radiative transport theory; inverse scattering methods; profile inversion. Prerequisite: EE 207. (Spring, odd years—evening) (Lang)

239 **Numerical Laboratory in Electromagnetics** (3)
Numerical methods for the solution of electromagnetic problems dealing with scattering by complex shapes, antenna design, transmission through anisotropic and dispersive media, electrodynamic interactions with charged particles. Convergence experiments dealing with moment methods, hybrid GTD, variational computations. Prerequisite: EE 207, CSci 100. (Spring, even years—evening) (Kahn)

241 **Information Theory** (3)
Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem, bounds on the performance of communications system, the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204. (Fall—evening) (Chang)

242 **Coding Theory** (3)
The PCM Communication System, mathematics of coding; groups, rings, and fields; linear codes, parity and generator matrices, syndrome error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation, cyclic codes, implementation and performance; BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. Prerequisite: EE 204. (Spring—evening) (Chang)

243 **Communication Theory I** (3)
Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise;

comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—day and evening; Spring—evening) (Pickholtz)

244 **Communication Theory II** (3)
Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov–Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring—day and evening) (Pickholtz)

245 **Signal Detection and Estimation Theory** (3)
Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244, or equivalent. (Fall—evening) (Pickholtz)

246 **Digital Communications** (3)
Digital transmission for data, voice, and video. Modern practice in data communication, voice digitization, PCM, delta modulation, linear predictive coding. Bounds for digital signaling, pulse dispersion and intersymbol interference. Nyquist criteria, eye openings; adaptive equalizers, decision feedback, partial response techniques. Regenerative repeaters; timing extraction, synchronization, and jitter. Transmission codes. Multiplexing and framing. Error control for data. Digital switching and integrated digital networks. Prerequisite: EE 241, 244, or equivalent. (Spring—evening) (Pickholtz)

247 **Communications Systems** (3)
Analysis and design of coherent communications systems. Phase-locked loop dynamics noise behavior and optimization. Parameter estimation theory and Wiener filters with application to optimum demodulation of analog waveforms (DSB-AM, SSB-AM, FM). Partially coherent digital demodulation. Comparative analysis of modulation systems. Frequency acquisition and synchronization. Selected topics in channel impairments and multiple access. Prerequisite: EE 241, 244. (Fall—evening) (Pickholtz)

248 **Data Communications Systems** (3)
Introduction to data networks. Common carriers, specialized carriers, value-added networks. Operations, facilities, services, tariffs. Data transmission over the telephone network. Channels, carriers systems, hierarchies. Terminals, modems, multiplexors, concentrators, communications processors. Standards and protocols. Coding for error control, data encryption. Data transmission via satellite. Communications software. Survey of domestic and foreign data networks. Regulatory and economic issues. (Should be taken in sequence with EE 249.) (Fall—evening) (Helgert)

249 **Theory of Data- and Computer-Communications Networks** (3)
Design and analysis of computer-communications and terminal-oriented networks. Line, message, and packet switching. Traffic theory for data. Queuing models. Delay and cost minimization, topological design algorithms. Network routing, polling, and flow control. Analysis and design of protocols for packet switched structures. Prerequisite: EE 204 or 205. (Should be taken in sequence with EE 248.) (Spring—evening) (Pickholtz)

*250 **Telecommunications System Concepts** (3)
Essential elements of an electrical communications system: speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse code modulation and comparative performance. Multiplexing schemes.

* EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science

communications quality standards, and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunications, microwave radio, cable, and satellite communications systems. (As arranged) (Pickholtz)

*251 **Survey of Telecommunications Systems** (3)
Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communications system. Digital transmission and terminals. Wideband data transmission. Frequency allocation. (As arranged) (Pickholtz)

252 **Digital Signal Processing Techniques** (3)
Signal representations, sampling and quantization, transform techniques. Recursive estimation, linear predictive filtering, recursive and nonrecursive digital filter design. Computer-aided design. Prerequisite: CSci 51 or equivalent. (Fall, even years) (Zaghloul)

253 **Sonar Systems** (3)
Underwater sound propagation; transducer and transducer arrays; detection, localization, and tracking techniques, array processing; time compression correlation and digital processing of signals, effects of nonhomogeneous noise fields; applications to navigation and communications in the ocean environment. Prerequisite: EE 204. (Fall—evening) (Helgert)

254 **Radar Systems** (3)
The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design, ambiguity functions; Doppler radar; phased arrays; synthetic aperture techniques; digital and optical processing and computer control. Applications. Prerequisite: EE 206, 244. (Spring—evening) (Helgert)

255 **Optical Processing** (3)
Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall, even years—evening) (Kahn)

257 **Secure Communications** (3)
Spread-spectrum techniques, time and frequency hopping, direct sequence encoding. Link jamming models and jamming effectiveness. Adaptive null steering arrays, nulling algorithms, effects of intelligent jammers. Data link encryption, data encryption standards, and public key cryptosystems. Prerequisite: EE 242, 243. (Fall—evening) (Pickholtz)

258 **Radio Communications Systems I** (3)
Analysis and design of microwave communications systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of Earth curvature and characteristics of over-land and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening) (Lang)

* EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

259 **Radio Communications Systems II** (3)
Morphology of the ionosphere, propagation of ionospherically reflected radiowaves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, nonGaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor. (Spring—evening) (Lang)

261 **Electromechanical Energy Conversion** (3)
Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements. Steady-state and dynamic performance of alternating current machines. Prerequisite: EE 202, 206, or permission of course director. (Fall—evening) (Harrington)

262 **Control of Rotating Machinery** (3)
Dynamic requirements of industrial drives. Detailed analysis of inverter circuits. Frequency control of inverter drives and cycloconverters. Computer modeling of rectifier and inverter circuits. Feedback control loops and their effect on stability. Prerequisite: EE 177, 201, 202, 206, 261, or permission of course director. (Spring—evening) (Harrington)

263 **Design of Reliable Emergency and Standby Power Systems** (3)
General requirements and guidelines. Factors affecting power line disturbances. Characteristics and settings of system protection. Disturbance effects on computer power supplies. Grounding and noise control. Evaluation of reliability of power systems. Reliability evaluation from an economic viewpoint. Cost of power outages. Reliability of specific equipment. Practical application problems. Prerequisite: EE 202, 206, or permission of course director. (Spring—evening) (Harrington)

264 **Direct Electrical Energy Conversion** (3)
Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid-state energy bands, work function and conversion efficiency, and limitations. Prerequisite: EE 202, 206, or permission of course director. (Spring—evening) (Harrington)

265 **Transients in Electrical Power Transmission Lines** (3)
Theory of traveling wave phenomena in electrical power transmission lines. Switching and lightning surges and the resultant overvoltages on long lines for various terminations. Breaker closing sequence effects and effect of source side inductance and multiple infeeds. Recovery voltage after short line faults. Methods and effectiveness of protection. Analysis of transient corona and its effect on wave shape. Methods of automatic calculation of overvoltages in complex systems and insulation level requirements. Prerequisite: EE 202, 206, or permission of course director. (Fall, odd years—evening) (Harrington)

266 **Electrical Power Transmission** (3)
EHV AC power transmission. Overhead line and underground cable transmission systems. Symmetrical components; short-circuit studies, load flow, transient stability, and sustained fault analysis, multimachine systems, machine and system modeling. Prerequisite: EE 178, 261, 265. (Spring, even years—evening) (Harrington)

267 **Power Networks** (3)
Practical studies using a computer in the following areas: load flow analysis, short-circuit analysis, transient stability, design of power system networks, insulation coordination. Prerequisite: EE 266. (Fall, even years—evening) (Harrington)

268 **Electrical Power Distribution** (3)
Transformer and insulation design at distribution voltage levels. Medium- and low-voltage switchgear requirements. Protective relaying, harmonic

filtering, power factor correction, grounding systems. Prerequisite: EE 178, 202, and permission of course director. (Spring, odd years—evening) (Harrington)

269 **Overall Electrical Power Generation Plant Design** (3)
Energy source design, boiler and turbine design and construction, synchronous generator and transformer requirements. Power station auxiliary plant. Exciter and governor design. Prerequisite: EE 177, 178, 202, 206, 261, 265, and permission of course director. (Fall, odd years—evening) (Harrington)

271 **Linear Multivariable Control Theory** (3)
Control of systems having multiple inputs or outputs. Topics useful in the control of multivariable systems include the algebraic theory of multivariable feedback; static and dynamic decoupling; invertibility; modal control; integrity, computer-aided frequency domain techniques such as feedback design, using inverse Nyquist arrays and characteristic loci design. Prerequisite: EE 172, 202, or equivalent. (Spring, even years) (Carroll)

272 **Computer Control Systems** (3)
An analysis of automatic control systems in which the control procedure uses on-line digital computation. Topics include single- and multirate sampling, Z transforms, responses of discrete systems, stability criteria, discrete control design. Prerequisite or concurrent registration: EE 202 (Fall) (Carroll)

273 **System Optimization** (3)
Parameter optimization problems; theory of minima and maxima. Optimization problems for dynamic systems; calculus of variations; the maximum principle and the Hamilton-Jacobi equation. Optimization problems with constraints, optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Spring—evening) (Carroll)

274 **Nonlinear Systems** (3)
Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov asymptotical method, and Tsypkin locus. Forced oscillations—jump resonance. Stability analysis—Liapunov criterion, Lure problem, and Popov method. Prerequisite: EE 203 (Spring, odd years—evening) (Carroll)

275 **System Identification and Adaptive Control Systems** (3)
Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control is the means whereby a system that is poorly modeled is controlled adequately. Various approaches to each of these problems are discussed, including the least-squares approach of identification and the stability approach to adaptive control. Prerequisite: EE 202, 204 (Spring, even years) (Carroll)

276 **Cybernetics** (3)
Principles of machines or mechanisms made by men or nature with regard to their ways and forms of possible behaviors, regular, determinate, or reproducible; fundamental concepts of finite differences; changes and transformations as sets of transitions, leading to stability and feedback; statistical concepts of complex systems and blackbox theory; Shannon's information theory, regulation and control of mechanisms. Prerequisite: EE 204 or equivalent. (Fall, odd years—evening) (Helgert)

277 **Satellite Communications Systems** (3)
Theoretical and applications aspects of satellite communications. Modulation and multiple-access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random-access techniques and satellite packet communications. Prerequisite: EE 244. (Fall—evening) (Pickholtz)

278 **Spacecraft Systems Design** (3)
Space environment, structure, propulsion, control, and instrumentation of

spacecraft—launch, orbit, transit, and re-entry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening) (Heller)

279 **Stochastic Control Systems** (3)
Introduction to random process in control; properties of Markov process, systems of covariance equivalence and of deterministic and stochastic control equivalence; dynamic programming for Markov process—principle of optimality, linear systems with quadratic cost, Kalman filtering, smoothing, and predicting. The separation theorem and applications concepts of adaptive estimations. Prerequisite: EE 204, 273. (Fall, odd years) (Lee)

280 **Introduction to Medicine for Engineers I: Physiology and Anatomy** (3)
The physiology of the human body from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs and related to the various systems of the body, interrelationships of the body systems, e.g., the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening) (Eisenberg)

281 **Introduction to Medicine for Engineers II: Physiology and Anatomy** (3)
Further elaboration of physiological systems, e.g., the endocrine system, renal physiology, gastrointestinal physiology; integration of the separate systems of the body to present the functioning of the body as an overall system. Prerequisite: EE 280. (Spring—evening) (Eisenberg)

282 **Medical Instrumentation I** (3)
Theory of measurements in biological areas, techniques for electronic measurements on biological specimens, current problems in medical metrology stressing electronic systems. Prerequisite: EE 280 or permission of course director. (Fall—evening) (Eisenberg)

283 **Medical Instrumentation II** (3)
Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 280 or permission of course director. (Spring—evening) (Eisenberg)

285 **Sensory-Evoked Potentials I** (3)
Physiological significance of the sensory-evoked potentials, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 280, 281, 282, 283, or permission of course director. (Fall—evening) (Eisenberg)

287 **Rehabilitation Engineering** (3)
Application of engineering theory and techniques to the rehabilitation of handicapped persons; major problem areas and general approaches, solutions. Prerequisite: EE 281. (Spring, odd years—day) (Eisenberg)

289 **Clinical Engineering** (3)
A cross-sectional view of clinical engineering applications, functions, variations, and patterns in the medical and allied health care area. Use of instrumentation, computers, and systems by clinical engineers in hospitals and clinics. The clinical engineer in cardiovascular measurement systems and intensive care units; other areas where functional usage of clinical engineering is applicable. Prerequisite: EE 281. (Fall, even years—evening) (Eisenberg)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

319 **Systems Science, Networks, and Controls Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

321 **Approximate Mathematical Techniques for Electromagnetics** (3)
Asymptotic methods for Maxwell's equations, geometric optics, WKB approximation for stratified media, uniform expansion near a caustic and shadow boundary; perturbation techniques for tenuous medium—Rayleigh Gans approximation, smoothing, and multivariable methods for stochastic problems. Prerequisite: EE 204, 207. (Spring 1982 and every third year thereafter) (Lang)

322 **Advanced Waveguide Diffraction and Design** (3)
Selections from the following: Analytical treatment of waveguide bifurcations and discontinuities by Wiener-Hopf, mode matching, static approximation, and other techniques. Small apertures (obstacles) in waveguides. Variational methods for evaluation of equivalent circuit parameters. Group theoretic methods for symmetrical junctions. Prerequisite: EE 233. (Fall 1982 and every third year thereafter) (Kahn)

323 **Principles of Microelectronics** (3)
Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening) (Heller)

329 **Electrophysics Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

345 **Advanced Detection Theory** (3)
Review of general estimation equations. Linear estimation; Weiner and Kalman-Bucy filters; nonlinear modulation theory; angle-modulation systems, analysis and design of phase-lock loops, optimum angle modulation, rate distortion theory; Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening) (Pickholtz)

346 **Communications Switching and Traffic Theory** (3)
Switching network technology, step-by-step common control, stored program electronic switching systems. Traffic models. Engineering of multiple server systems, analysis of graded multiples and multistage connecting networks. Software issues, digital time division and store and forward switches. Analytical bounds on the complexity of switched networks, combined circuit and message switching. Current practice and practical issues. Prerequisite: EE 243 or permission of course director. (Spring, even years—evening) (Pickholtz)

347 **Data Communications** (3) (Same as CSci 244)
Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexors, concentrators. Line control procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data collection loops, multidrop lines. Switched data systems, circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: EE 243; CSci 201, 202, or permission of course director. (Spring—evening) (Pickholtz)

349 **Communications Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

364 **Applications of Direct Energy Conversion** (3)
Electrostatic and magnetic conversion systems, conversion of heat to electricity, thermoelectric systems, conversion of light to electricity, fuel cells and batteries, magnetohydrodynamic systems, superconductive machines and systems. Prerequisite: EE 264. (Spring, even years) (Harrington)

368 High-Voltage Testing Techniques for Electrical Apparatus (3)
Methods and procedures for measurement of high voltage; basic testing techniques for alternating voltages, direct voltages, lighting impulse voltages, switching impulse voltages, and impulse currents for conducting tests on all types of apparatus. General applications and requirements regarding test objects and test procedures. Determination of the dielectric strength of electrical insulation materials at commercial power frequencies. The use of sphere gaps for the measurement of peak values; the geometry of the standard sphere gap, its connections and use. Procedures for wet tests, contamination testing, and an application guide for measuring devices. **(Spring, even years—evening) (Harrington)**

369 Issues in Electrical Power Generation and Transmission (3)
Assessment of various energy systems. Interfacing of different types of energy systems. Dispersed generation; concepts of conversion and cogeneration. Pollution control. Biological effects of high electric and magnetic fields. Prerequisite: EE 264, 265, 267, and permission of course director. **(Spring, odd years—evening) (Harrington)**

371 Simulation Methods for System Analysis (3)
Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of course director. (Fall, odd years—evening) (Bock)

372 Analysis and Control of Large Systems (3)
Systems as multistage decision processes. Analytical concepts of model making and matrix representations of large systems. Approximation by models of lower dimension—reduction to simplified models, decentralized systems. Differential games; computation of saddle points; construction of an equilibrium point. Prerequisite: EE 273. (Fall, even years—evening) (Lee)

381 Computer-Aided Analysis of Physiological Signals (3)
Computer analysis of physiological data obtained from the cardiovascular, pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems; preprocessing of real signals; algorithmic techniques applicable to the analysis of these signals. Students are provided with real data and develop computer software for determining pertinent medical parameters as established by physicians. Prerequisite: EE 280, 281, 282, 283, and working knowledge of FORTRAN. (Fall, even years—evening) (Loew)

382 Physiological Controls and Systems (3)
Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems theory to the visual system, respiratory system, cardiovascular system, and musculoskeletal system. Prerequisite: EE 172 or equivalent, 280, 281, 282, 283. **(Spring, even years—evening) (Loew)**

384 Medical Imaging (3)
Principles of medical imaging by projection radiography, fluoroscopy, tomography, ultrasound, and nuclear sources. Characterization of source and object; recorder resolution and noise, analysis of scatter, energy considerations; attenuation; computerized tomography. Mathematics, algorithms, and implementation. Ultrasonic imaging in A-, B-, and M-modes; tissue characteristics; imaging using arrays. Nuclear imaging with gamma-ray cameras, Anger camera, positron emission tomography. Prerequisite: EE 201 or equivalent, 280, 282, 283. (Fall, odd years—evening) (Loew)

385 **Sensory-Evoked Potentials II** (3)
A continuation of EE 285. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research; emphasis on clinical applications. Planning and conducting an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background from an instrumentation, computer, and data analysis viewpoint. Prerequisite: EE 285, permission of course director. (Spring, odd years—evening) (Eisenberg)

386 **Bioelectromagnetics** (3)
Electrical properties of biological tissues. Mechanisms for electromagnetic interactions with biological systems. Energy absorption and heat production. Non-ionizing radiation dosimetry and quantification of microwave and radio frequency hazards. Temperature measurement in the presence of a strong electromagnetic field. Physical aspects of diathermy and hyperthermia. Other therapeutic and diagnostic applications of electromagnetic energy. Prerequisite: EE 31, 32, 280, 281, or permission of instructor. (Fall, odd years—evening) (Cheung)

387 **Bioelectric Phenomena** (3)
Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics; membrane electrical potentials and subthreshold membrane effects; membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 280, 282, 283. (Spring, even years—evening) (Cheung)

389 **Medical Engineering Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

Computer Science Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

201 **Introduction to Computer Systems** (3)
Introduction to programming digital computers in assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Techniques of structured programming. Use of a higher-level procedural language. Stacks and recursion. (CSci 201 is equivalent to CSci 157 and 158.) Prerequisite: CSci 51 or 100 or equivalent (FORTRAN) and programming experience using assembly language. (Fall and Spring—evening) (Bock)

203 **Microprocessors and Microcomputers** (3)
Microcomputer structure and components. Microprocessor architecture, registers, ALU, stacks, information flow, and control. Microprocessor support hardware, RAMs, ROMs, PLAs, counter timers. Hardware and software of typical 8-bit microcomputers. I/O structure in microcomputers; interrupts and DMA operations. 16-bit microprocessors, hardware structure, and software capabilities. Bit-slice microprocessors. Prerequisite: CSci 154 or permission of course director. (Fall and Spring) (Abd Alla)

208 **Computer Programming** (3)
Use of a macroassembler in structured programming. Input-output programming at the assembly level. I/O buffer pools and their management. Program

status and control, interrupt handling, reentrant subroutines. Linkers and loaders. Utilities. Introduction to operating systems and job control languages. Prerequisite: CSci 157, 158; or CSci 201; or permission of course director. (Fall—evening) (Maurer)

213 **Discrete Structures in Computing** (3)
Introduction to discrete mathematical structures used in computing. Sets, graphs, functions, mappings, lattices, groups, and semigroups. Combinatorial problems and enumerations. Finite-state machines, representations, identification, transitions, and reductions. Directed graphs, trees, and paths through a program. Regular expressions and relations between programs and computing machines. Prerequisite or concurrent registration: CSci 51 or 100, permission of course director. (Fall and Spring—evening) (Pickholtz)

215 **Advanced Data Structures and High-Level Algorithms** (3)
Sparse matrix transpose and multiplication. List insertion and deletion, lists of available space. The boundary tag method, the Deutsch–Schorr–Waite algorithm, the Knuth–Morris–Pratt algorithm. In-order, preorder, and postorder traversal of trees, alpha-beta pruning. Tarjan's UNION and FIND. Depth-first and breadth-first search, Kruskal algorithm, topological sorting, shortest paths in a graph. Quicksort, heap sort, radix sorting, merge sorting, sorting of files. Binary search trees, including AVL trees. B-trees, and tries. Hashing and collision handling. Critical paths and PERT. Prerequisite: CSci 159. (Spring—evening) (Berkovich)

216 **Information Retrieval Systems** (3)
Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural language used for retrieval systems, dictionary systems including thesaurus look-up and phrase structures; searching strategies and cataloguing. Input preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 159 or permission of course director. (Spring—evening) (Berkovich)

219 **Interactive Computer Graphics I** (3)
Architecture and implementation of display and interaction devices. Interactive graphics programming. Functional capabilities of graphics packages. Implementing a graphics package. Two- and three-dimensional viewing, clipping, and transformations. Interaction techniques and human factors. Raster graphics scan-conversion algorithms. Hidden-surface and hidden-edge removal algorithms. Shading and texturing techniques. Prerequisite or concurrent registration: CSci 159 or permission of course director. (Fall—evening) (Foley)

220 **Pattern Recognition** (3)
Applications of pattern recognition, vector spaces, estimation and samples, Bayes estimation, density functions, stochastic approximation, decision rules in pattern recognition, minimal risk, Gaussian filters, bounds of risk, nearest-neighbor decision rules, clustering techniques, feature extraction. Sequential and nonparametric methods. Pattern recognition with *a priori* knowledge. Introduction to syntactic methods. Computer applications and projects. Prerequisite: EE 204. (Fall—evening) (Loew)

221 **Simulation and Heuristics** (3)
Techniques of deterministic and probabilistic simulation on the digital computer. Mathematics for simulation, design of systems modules; random number generation and testing. Markovian and bounded context systems; generation of stochastic variates; Monte Carlo techniques, heuristics, verification techniques; simulation languages. Prerequisite: ApSc 115, CSci 159, and permission of course director. (Fall—evening) (Bock)

222 **Design of User–Computer Dialogues** (3)
Design of dialogues for interactive terminal systems, including graphics systems. Psychological, physiological, linguistic, and perceptual factors. Advantages and disadvantages of various interaction techniques, command

language syntaxes, and data presentations. Design methodology and guidelines. Case studies, research readings, and projects. Prerequisite: CSci 159 or permission of course director. (Spring—evening) (Foley)

223 **Computational Heuristics** (3)
Learning stochastic automata theory. Collective and hierarchical automata. Markovian and bounded context systems. State transition descriptions of processes. Environment policies. Stationary and nonstationary compensation policies. Update algorithms. Algedonic processes. Optimality and expediency criteria. Application of inductive learning methods to artificial intelligence. Expectation and confidence criteria for verification. Class projects to illustrate heuristic methodologies. Prerequisite: CSci 157, 221. (Spring—evening) (Bock)

224 **Artificial Intelligence** (3)
Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene analysis and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill climbing, network searching, min–max and alpha–beta pruning. Problem-solving systems. Prerequisite: CSci 159 (Spring—evening) (Bock)

226 **Robotics** (3)
Industrial automation. Manipulator and sensor technology. Feedback loops and analog servos. Multiple degrees of freedom and coordinate systems. Joint-space work-space transformations and data structures. Point-to-point continuous path control. Robot control command languages, navigation and mapping, optical and acoustic ranging and pattern recognition, collision avoidance algorithms, positioning accuracy, resolution, and repeatability. Distribution of intelligence. Adaptive hierarchical control. Class projects using the Mobile Robot in the Interactive Systems Lab. Prerequisite: CSci 159 or permission of course director (Spring—evening) (Bock)

227 **Management Information Systems and Database Management** (3)
Concepts in management information systems. Commercial programming features of COBOL and PL/1. Inverted files and query systems. Editing, report generation, updating, and updating load. Trade-off between direct access and indexed-sequential access. Maintaining large programming systems that lead to the need for database management systems; construction of database management systems. Survey of some existing database systems. Relational database concepts and future developments. Conceptual and logical design of a database. Prerequisite: CSci 159 (Fall—evening) (Berkovich)

229 **Security and Privacy in Computer Systems** (3)
Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, problems of statistical inference. Effects of operating systems and machine architecture on security. Cost trade-offs and risk analysis among various countermeasures. Theoretical models. Related nontechnical measures. Effect on system design of legal constraints on data banks. Current and potential legal constraints. Prerequisite: CSci 159 or equivalent. (Fall—evening) (Hoffman)

*230 **Information Policy** (3)
Topics of current interest in information policy, including privacy, freedom of information, antitrust and other business implications of policies, transborder data flow, information as a weapon, cryptographic policy, international aspects of information law and policy, technology transfer, electronic funds transfer, electronic mail, criminal justice information systems, and cross-cultural implications and the lower classes. Prerequisite: CSci 100 or equivalent. (Spring—even years) (Hoffman)

* CSci 230 is not counted as part of the major course offerings in computer science.

231 Sequential Machines (3)
Finite state sequential machine theory and design, state identification, information losslessness, state minimization in incompletely specified tables partition theory, decomposition of machines, asynchronous machine design, structural simplicity and design with ROMs and PLAs (Planar Logic Arrays). Prerequisite: CSci 153. (Fall—evening) (Friedman)

232 Automata and Formal Languages (3)
Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive functions, predicate calculus, and computability. Complexity of algorithms. Formal language theory including grammatical construction, recognizers, relationships between machines and grammars. Nondeterministic automata. Prerequisite: CSci 213. (Spring, odd years—evening) (Feldman)

237 Computing Systems (3)
Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage devices; computer control and interrupt structures. Input–output channels and interfacing problems. Communications in digital computers. Introduction to multiple-access and time-sharing systems. Prerequisite: CSci 154. (Fall—evening) (Abd Alla)

239 Comparative Computer Systems (3)
Structures of computers and a general language for system description. History of different computer structures. Development of the operating system. Special purpose processors. Multiprocessors and large computing systems. Computer networks and time-shared systems. Comparison of computer families. Characteristics and philosophies of computer design of the major manufacturers. Introduction to performance evaluation and measurement. Effects of software and technology on computer structures. Prerequisite: CSci 208, 237. (Spring—evening) (Meltzer)

240 Theory and Practice of Microprogramming (3)
Basic concepts, techniques, and theory of microprogramming as applied to the implementation of control systems for sequential machines. Microprogramming languages, assemblers, and hardware simulators, including specific applications of these to the design of current computer systems and their interfaces with real-time systems. Prerequisite: CSci 157, 237. (Spring—evening) (Abd Alla)

243 Fault Tolerant Systems and Design Automation (3)
Fault test generation for combination and sequential circuits, digital simulation as a diagnostic tool, design of easily tested and fault tolerant systems. Physical packaging of digital circuits, design of circuit boards including partitioning, placement, and interconnection of elements. Prerequisite: CSci 153. (Fall—evening) (Friedman)

244 Data Communications (3) (Same as EE 347)
Principles and practice of modern data communications. Modes for data transmission, terminals, modems, multiplexors, concentrators. Line control procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data collection loops, multidrop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: EE 243, CSci 201 or permission of course director. (Spring—evening) (Meltzer)

245 Advanced Computer Systems Theory I (3)
Analytical models applied to computing systems. Determinance, deadlocks, concurrency, and synchronization of computer processes. Optimal task scheduling using linear graph theory. Concurrent processes in multiprocessors. Analysis of the overlap of I/O and CPU processing. Queuing theory applied to time-shared computer models. Analysis of secondary storage devices and effective data rate. Analysis of memory buffer pools and multiprogrammed

memory allocation. Memory allocation and storage hierarchy operation and their effect on throughput and response time. Prerequisite: EE 204; CSci 208, 237. (Fall—evening) (Abd Alla)

246 **Advanced Computer Systems Theory II (3)**
Optimum secondary storage placement algorithms to improve throughput. Modeling of secondary storage operation and data staging. Analysis of memory allocation algorithms to improve system performance. Characteristics of computer system hardware and software to provide for multiprocessing, multiprogramming, and time-shared operation. Loosely and tightly coupled multiprocessors. Analysis of front-end processors in database operation and computer networks. System analysis of a large time-shared, terminal-oriented transaction processing system. Prerequisite: CSci 245. (Spring—evening) (Abd Alla)

255 **Analysis and Correctness of Algorithms (3)**
Basic tools of analysis of algorithms. Space and time measures, O(n) and O(f(n)), computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 159. (Fall—evening) (Maurer)

256 **Design of Translators (3)**
Design of procedure-oriented computer languages. Semantics and pragmatics as they affect the design of translators, interpreters, and compilers. Top–down and bottom up recognizers. Production of machine code. Syntax-directed compiling. Tables and their organizations in translators. Optimizing compilers; compiler compilers. Prerequisite: CSci 159. (Spring –evening) (Maurer)

258 **Advanced Programming Languages (3)**
Recent developments in programming language research. Modern data-structuring concepts such as abstract data structures, access control for reliability, and structuring of data in special-purpose languages. Language extensibility. Machine-independent design of language processors. Case studies: SNOBOL 4, PASCAL, and advanced concepts in PL/I. Projects emphasize applications of these languages and concepts. Prerequisite: CSci 159 and permission of course director. (Spring, even years –evening) (Feldman)

263 **Digital Computer Programming Systems (3)**
Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control including linking, loading, linkage-edit, relocatability, region size, and status switching. Design of dispatchers and monitors. Design of utility programs. Input–output programming and control. Communications among components of the operating system. Prerequisite: CSci 159, 208. (Spring –evening) (Maurer)

267 **Operating Systems I (3)**
Introduction to the operating system for batch-oriented multiprogrammed computer systems. Software components that constitute the operating system. Facilities of the macroassembler utilizing the operating system; loading and linking routines; initializing programs and tasks; dispatching and the interrupt mechanisms. Memory management in fixed and variable partitions; device and storage management. Input–output control and use of access methods. Performance evaluation. Prerequisite: CSci 208. (Fall—evening) (Hoffman)

268 **Operating Systems II (3)**
Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system; deadlocks, processor utilization, and I/O management. System availability and

fail-soft mechanisms. Time-slicing and time-sharing operating systems and subsystems, transaction processing subsystems; memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and an introduction to the computer as a utility. Introduction to security and large database management. Prerequisite: CSci 267. (Spring—evening) (Hoffman)

278 **Analog and Hybrid Computers** (3)
Analog computer components and electronics. Slow analog computer solutions of linear and nonlinear differential equations. System simulation and modeling on the analog computer. Introduction to the iterative analog computer. Transfer function simulation and use in control theory. The hybrid computer, digital logic, and digital computer control. Digital-to-analog and analog-to-digital converters and interfaces. Optimization methods on a hybrid computer. Parameter variations and searching methods. Prerequisite or concurrent registration: CSci 154 or permission of course director. (Fall, even years—evening) (Bock)

281 **Applications of Numerical Methods I** (3)
Basic numerical methods with emphasis on their application to engineering problems. Error sources and error control, numerical representation of functions; over-determined systems; eigenvalues and eigenvectors; introduction to nonlinear equations, initial-value and boundary-value problems for ordinary differential equations. Theoretical concepts such as order of accuracy, Richardson's extrapolation, norm, stability, and convergence. Some modern methods such as spline approximation and the QR algorithm for eigenvalues. Prerequisite: CSci 201 or equivalent. (Fall—evening) (Meltzer)

282 **Applications of Numerical Methods II** (3)
A continuation of CSci 281. Systems of nonlinear equations, numerical optimization; numerical solution of common partial differential equations of engineering; methods for hyperbolic, parabolic, and elliptic problems; introduction to finite element methods. Prerequisite: CSci 281. (Spring, even years—evening) (Meltzer)

285 **Approximation of Functions and Data Representations** (3)
Review of linear spaces, least squares, orthogonal functions, nonlinear techniques, gradient search methods, parameter estimation with discrete data, Tchebysheff approximation, approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening, at NASA Langley Research Center, Fall, odd years—evening, on campus) (Meltzer)

286 **Numerical Methods in Engineering I** (3)
Computational methods for solution of systems of linear algebraic equations and for the solution of the algebraic eigenvalue problem. Emphasis on accuracy and efficiency. Methods for banded and other sparse systems. Methods for parallel and pipeline processor computers. Prerequisite: CSci 281, knowledge of linear algebra. (Spring, even years—evening) (Meltzer)

287 **Numerical Methods in Engineering II** (3)
Computational methods for solution of systems of ordinary differential equations single-step methods, general multistep methods, convergence and stability analysis, methods for stiff equations, step size control, and control of order. Prerequisite: CSci 281, knowledge of differential equations. (Spring, odd years—evening) (Meltzer)

288 **Numerical Methods in Engineering III** (3)
Computational methods for solution of boundary-value problems in both ordinary and partial-differential equations: shooting methods, finite difference methods, functional approximation methods, invariant imbedding, method of lines, treatment of boundaries in multidimensional problems. Prerequisite: CSci 282, knowledge of differential equations. (Fall, even years—evening) (Meltzer)

289 **Numerical Methods in Engineering IV** (3)
Computational methods for solution of initial-value problems for partial-differential equations: method of lines, consistency, stability, convergence; explicit and implicit finite difference methods, alternating direction methods, high-order methods. Prerequisite: CSci 282, knowledge of partial-differential equations. (Spring, odd years—evening) (Meltzer)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

319 **Interactive Computer Graphics II** (3)
Hidden surface algorithms, mathematics and data structures for surface representation, surface texture models, color models, animation, simulation, graphics programming languages, architecture of high-performance hardware, homogeneous coordinates. Prerequisite: CSci 219. (Spring, odd years—evening) (Foley)

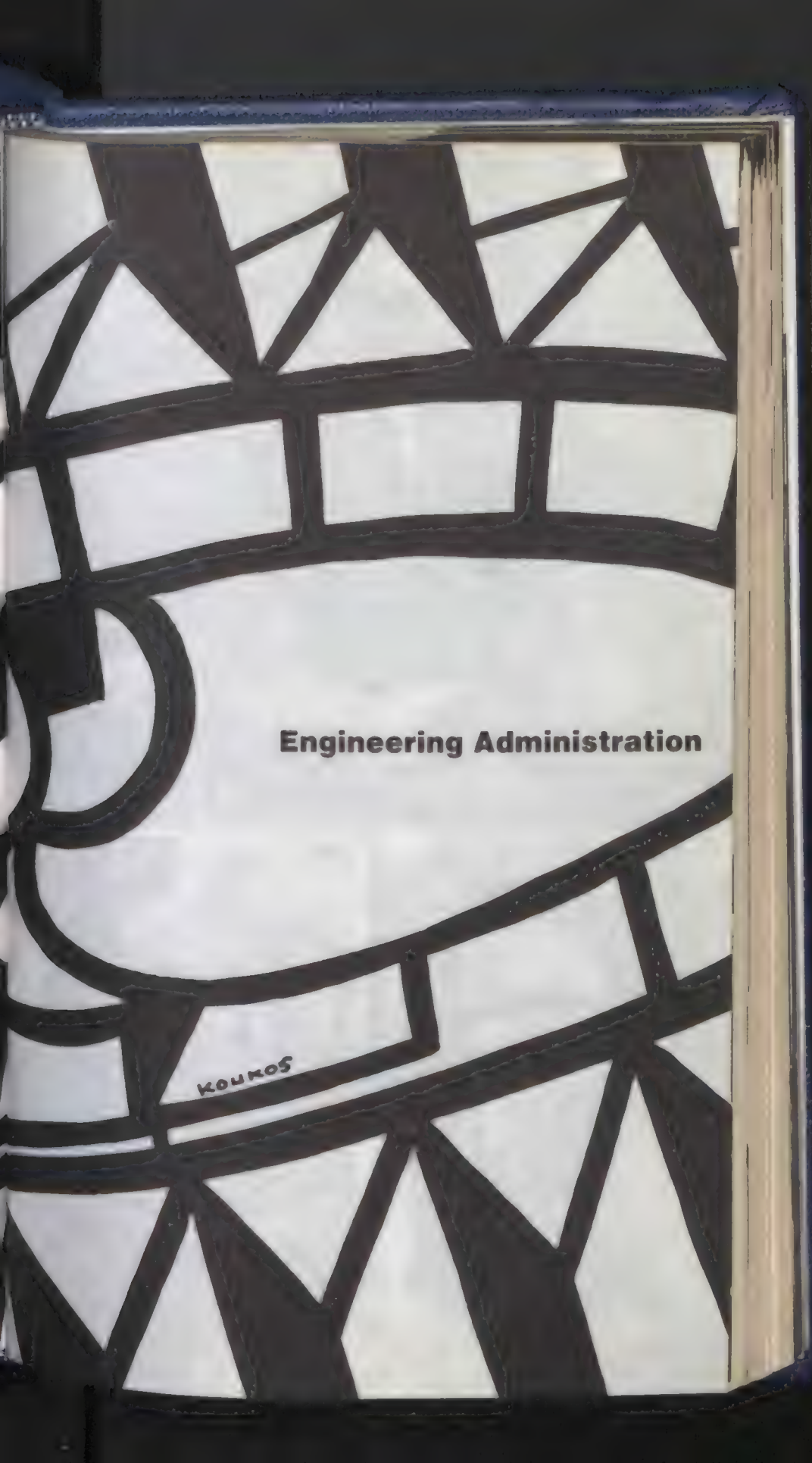
327 **Advanced Topics in Information Systems** (3)
Special topics: architecture of information systems, organization of large dynamic files, multidimensional search, user interfaces, and database machines. Students are encouraged to present reports in information systems research. Prerequisite: CSci 159 and one of 215, 216, or 226, or permission of course director. (Fall, odd years—evening) (Berkovich)

391 **Computer Science Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

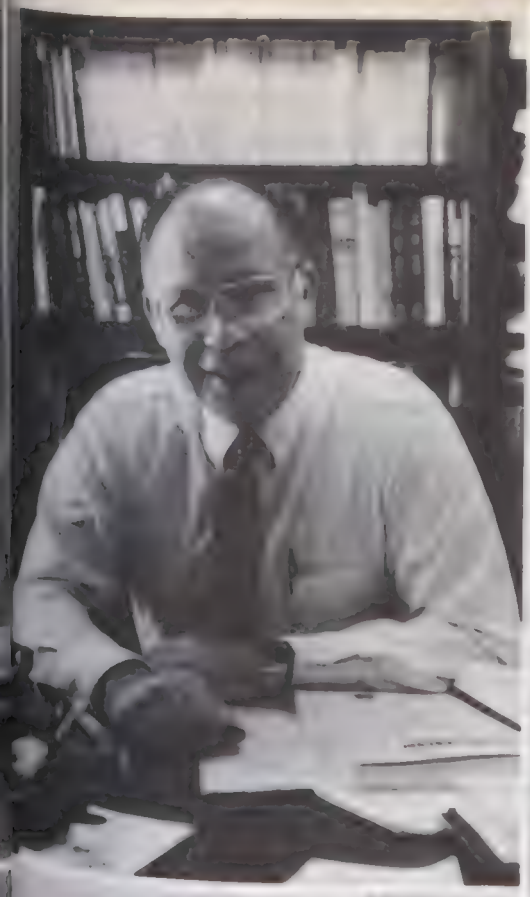


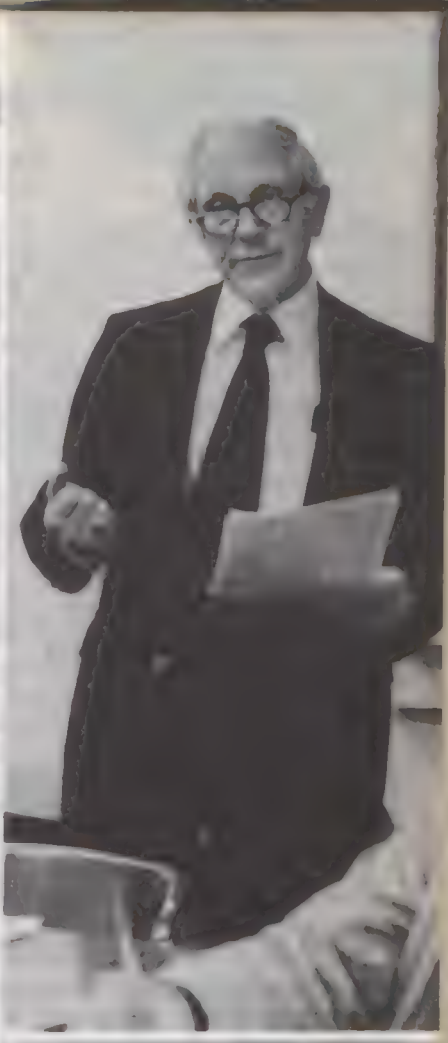



Engineering Administration
KOUKOS













Engineering Administration

Professors P.A. Crafton, P.S. Shane, J. Kaye, M. Apstein *(Research)*, S. Rothman *(Chairman)*, H.M. Steiner, R.C. Waters, J.H. Schulman *(Research)*, H.B. Sewell

Adjunct Professor J.E. Duberg

Professorial Lecturers J.B. Du Peza, C.W. Fotis, D.P. Hearth, R.A. Hemmes, G.T. Malley, J.A. Belding, Jr., D.R. Levin, E.S. Hoe, G.W. Leonard, R.L. Bangert, L.H. Blakey

Associate Professors B.G. Silverman, J.F. Dinwiddie

Associate Professorial Lecturers G.M. Hollander, P. Rosenberg, C.A. Kottman, W.A. Goetz, J.R. Margulies, R.J. Lynch, Jr., R.R. Blanchard, J.P. Solomond, V.R. Hayles, R.P. Rhode, J.F. McNulty, K.D. Wade, S.F. Pauls

Assistant Professorial Lecturers T.L. Griswold, H.S. Kimmel, R.N. Gurley, R.E. Snyder, R.B. Reynolds, J.L. Pokorney, M.P. Clark, A.M. Biddison, W.L. Taylor III, R. Doyon, J. Rossi, J.D. Liveris, J. Patrick, J. Tulenko

Graduate Programs in Engineering Administration and Areas of Concentration

Programs in Engineering Administration lead to the Master of Engineering Administration, Professional, and Doctor of Science degrees. Included are a general program in engineering administration and programs in administration of research and development, construction management, environmental and energy management, information systems management, marketing of technology, technology and public affairs, and transportation management.

Master of Engineering Administration Degree Program

The principal objective of the program leading to the degree of Master of Engineering Administration is to prepare students whose undergraduate education was in engineering, natural science, or mathematics, as reflected by an appropriate degree, for positions of managerial responsibility in technological and scientific organizations in industry, government, or the armed services.

The program consists of a minimum of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). With the approval of the department the student may elect an optional program without a thesis, which consists of a minimum of 33 semester hours of approved graduate courses.

The program is designed to help the student achieve a broad understanding of the administrative process. Although years of experience are required to develop the skills, insight, and mature judgment that distinguish an effective manager in technological and scientific organizations, a graduate professional management curriculum can give the student an effective start as a manager. The curriculum provides an opportunity to gain understanding and to develop useful managerial skills in the functional areas of engineering administration.

One of the major purposes is to assist the student in forming the habit of examining problems from an overall managerial point of view. The individual's own particular experience and the explicit process of relating this experience to graduate study provide each student with a personal frame of reference to interpret management in a rapidly changing world.

Successful education for engineering administration gives an understanding of what it is that an engineering manager must do, an analysis of the broad functions involved in management, and a detailing of modern methods useful in making and executing decisions in the management of technological and scientific organizations. It is the aim of the Department, therefore, to keep alive a spirit of general inquiry and a decision-making orientation.

The management of technological organizations is one of the most difficult challenges of our times. The professional engineering manager today must understand not only currently developing technologies but also the rapidly changing marketplace where these technologies are applied for society's benefit. The engineering administrator is the link between these dynamic technologies and the needs of society in general.

In summary, the program of study has for its objective an educational experience that will contribute to the development of managers possessing a combination of technical know-how and administrative skill.

Admission

The principal objective of the program leading to the degree of Master of Engineering Administration is to prepare students whose undergraduate education was in engineering, natural science, or mathematics for positions of managerial responsibility in technological and scientific organizations.

In addition to the requirements for admission to graduate study (see pages 28–29), applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have basic knowledge of the principles of management, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of EAd 150, 160, and 170 or approved equivalents. (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration, and unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

A student must be accepted in a graduate program to receive credit for any graduate courses taken to satisfy degree requirements.

Core Courses

The following courses are required for the Master of Engineering Administration degree and are to be taken prior to any other course in the program:

EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision Making and Problem Solving (3)

General Program

Engineering Administration

Study in engineering administration provides the conceptual depth in management practice and knowledge needed by technical and scientific personnel who are confronted with increasing demands and complexities. Technical knowledge is complemented by understanding of theory and practice in management action. Engineering management is a logical development of a technological society. The program is designed to provide engineers with knowledge and proficiency in the administration of engineering and science. It emphasizes use of deliberative, purposive study of general administrative problems and opportunities as well as the study and use of specific knowledge and methods needed to solve administrative problems and to explore opportunities. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (15–21): Electives are chosen from the Department of Engineering Administration and other departments of the University, but no more than two courses may be chosen from other departments.

Areas of Concentration

Students wishing to pursue a specific area of concentration, as opposed to following the general program in engineering administration, may select one of the following programs:

Administration of Research and Development

The program is designed to prepare students for responsible managerial positions in organizations conducting technological or scientific research and development and in organizations planning and administering programs of technological or scientific research and development. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 207 The Personnel Function for Engineering Administrators (3)
EAd 255 Administration of Research and Development (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (9–15)

Construction Management

Construction management encompasses managerial functions in an organization that plans and executes major construction work. This can take place in the field, in the project office, or in a main office. Due to the inherent complexity of present-day engineering, engineers need to know management as well as basic planning, design, and construction methods. They need to know construction developments, problems of contracts and specifications,

techniques of scheduling and control, estimating, labor relations, and industrial or management psychology.

This program prepares the engineer for the task of marshalling men, materials, machines, and money as functions of time, cost, weather, and human nature to plan and build structures. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 241 Construction Management I (3)
EAd 242 Construction Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Environmental and Energy Management

This program prepares students for positions in organizations involved with environmental, energy, and related resource management. This includes organizations conducting environmental control and energy conservation and organizations planning and administering programs in energy resource development/utilization and in prevention and control of environmental pollution. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 221 Environmental Management (3)
EAd 222 Energy Management (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Information Systems Management

Managers of technological and scientific organizations encounter a variety of management information systems required for day-to-day operations and long-range decisions. This program helps to provide managers with the competence to use such systems effectively. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 251 Management of Information Processing Resources (3)
EAd 254 Automatic Data Processing Systems (3)
EAd 295 Management of Technical Information (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Marketing of Technology

As the American economy matures and Americans survey the spectrum of options available to them, it is apparent that scientific and engineering outputs must be sold in worldwide competition both at home and abroad. The trained specialist is becoming more important than ever before in performing the selling function. The objective of this program is to prepare students for responsible positions in marketing technical products and services. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 293 Technical Enterprises (3)
EAd 294 Marketing of Technology I (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
EAd 311 Marketing of Technology II (3)
Electives (6–12)

Technology and Public Affairs

This program prepares students for responsible positions requiring managerial decision making on matters that involve the impact of technology on public policy and that concern the general interrelationship between modern technology and public affairs. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 288 Technology Issue Analysis (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
EAd 386 Advanced Topics in Management (3)
Electives (6–12)

Transportation Management

This program prepares students for responsible positions in the management of transportation systems or in the formulation of transportation policy. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 265 Transportation Management I (3)
EAd 266 Transportation Management II (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Professional Degree Program

The Department of Engineering Administration has established the professional degree program for those students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or to the degree of Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in engineering administration.

In the professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Each student's program is planned considering his or her background and needs, consistent with departmental requirements.

Areas of Specialization

The professional degree program provides post-master's degree graduate study in areas in which the Department has adequate facilities and resources. Upon departmental approval, the student may select courses in other University departments to meet specific needs or objectives. Courses can, upon departmental approval, be chosen in the following areas:

Administration of Research and Development
Construction Management
Engineering Administration
Environmental and Energy Management
Information Systems Management
Marketing of Technology
Technology and Public Affairs
Transportation Management

A student's program of study will provide concentration in a selected area and include courses from other areas. A program consists of a minimum of 30 semester hours of approved graduate courses beyond a master's degree, 6 of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of semester hours.

Admission

Admission to graduate study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Engineer (in Engineering Administration), an applicant must possess a bachelor's degree in engineering; for the professional degree of Applied Scientist (in Engineering Administration), an applicant must possess a bachelor's degree in mathematics or a natural science. In both cases a master's degree in engineering administration or a related field is required. Applicants having equivalent backgrounds of study may be considered. At least a 3.1 average in the master's degree program studies is required.

Those applicants having master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) and one elective, selected with approval of the student's adviser, with a grade of *B* or better.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. No courses taken by the applicant to meet these prerequisite requirements and conditions can be applied toward the professional degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of only 9 hours of this additional course work can be applied, with the approval of the adviser, toward meeting degree requirements.

Transfer Credit

Up to 6 semester hours of satisfactory study (with grades of *A* or *B*) in a graduate degree program beyond a master's degree will be considered for transfer toward the professional degree. Previously earned credits must have been earned within five years of admission to candidacy for the professional degree and must be appropriate for the student's professional degree program. The student must, with the approval of his or her adviser, petition the Department Chairman for such transfer.

Program of Study

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission and professional degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned project or to meet other needs. With prior approval of the adviser, up to 12 semester hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 12 hours include the 6 potential transfer credits.

Professional Project

Each degree candidate must engage in a professional project on which the candidate will submit an acceptable report of an analysis and solution of a real-world problem in engineering administration. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to work through to a solution, and to communicate the results in writing.

When the course work is essentially completed and with the adviser's approval, the candidate will register for EAd 395–96 Seminar: Professional Project (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study and prepared a written study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the Department Chairman for approval. Six semester hours are assigned for work on the professional project.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years, from the date of the student's first registration as a graduate student in prerequisite or graduate courses, to complete all degree requirements. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the professional degree program under whatever conditions and regulations are in effect at that time.

Doctor of Science Degree Program

A program in Engineering Administration leading to the degree of Doctor of Science provides advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 36–37.

Applicants for doctoral study in Engineering Administration must have a master's degree, with a record of superior academic achievement (at least 3.40) in engineering administration or a related field. Those applicants having master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) and one elective, selected with approval of the student's adviser, with a grade of *B* or better.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing

all course and language requirements and qualifying examinations (see pages 37–38). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of only 9 hours of this additional course work can be applied, with the approval of the adviser, toward meeting degree requirements.

Language Requirement

A doctoral student should maintain a broad outlook in pursuing his or her study and, therefore, must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language must be demonstrated before admission to the qualifying examination. The student must obtain approval from his or her doctoral adviser before the language is selected.

Transfer Credit

Up to 6 semester hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a master's degree will be considered for transfer toward the doctoral degree. They must have been earned within the five years preceding admission for the doctoral degree and must be appropriate to the student's doctoral degree program. The student must, with the approval of his or her adviser, petition the Department Chairman for such transfer.

Programs of Study

In addition to the major field of engineering administration, a minor area of concentration is normally required, which may be chosen from the areas administered by this Department or from appropriate areas available in other departments of the University. The general requirements for doctoral study are stated on pages 36–40.

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the qualifying examination, and doctoral degree requirements. An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs. The program of study for each student must be approved by the student's adviser and the Department Chairman.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on pages 38–40. Once the qualifying examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal that includes consideration of the merit of the proposed research and the adequacy of his or her preparation to conduct it successfully. The detailed project proposal is submitted for approval to the Department Chairman and a selected faculty member, who will serve as the student's Director of Research. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 while the research is conducted.

Scholarship

A student studying for the doctoral degree must achieve a cumulative quality-point average of at least 3.40 to receive the degree. No such student may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited.

Time Limits

A full-time student in the doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 40).

Students who do not complete degree requirements within the allowed time will have their gradute status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the doctoral degree program under whatever conditions and regulations are in effect at that time.

Graduate Study in Systems Analysis and Management

Master of Science Degree Program

The Master of Science degree is offered to students specializing in systems analysis and management. The program is administered by the Department of Engineering Administration with the cooperation of the Department of Operations Research.

The systems viewpoint has been productive in the design of organizations and in detecting, analyzing, and solving organizational problems. It emphasizes the interconnectedness of elements and activities of a system, including personnel considerations. An increasing need exists for individuals who can apply the systems approach to organizational systems.

Analysis, synthesis, and management of organizations from the systems standpoint require a blend of studies from the areas of management and operations research. Study of management and operations research provides insights into organizations and their personnel, understanding of the viewpoints and techniques of managers with whom the systems analyst or manager must interact, mathematical and statistical tools for the analysis and synthesis of systems, and scientifically based methods for detection, analysis, and solution of system problems. Consequently, a systems analyst/manager uti-

lizes a mathematical or nonmathematical formulation of information as appropriate to the situation. The increasing application of computers for management makes understanding of their capabilities essential.

Admission and Prerequisites

In addition to the general requirements for admission to graduate study (see pages 28–29), applicants must meet the following requirements: (1) The applicant must have basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computers. The requirements can be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. (Students may not earn graduate credit for these courses.) (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission. The student is required to earn the grade of *C* or better (unless upon admission the requirement is stipulated to be a grade of *B* or better) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Science in Systems Analysis and Management, and unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Required Courses

Course descriptions for the systems analysis and management degrees are found in the respective departments as indicated by the departmental abbreviation (e.g., EAd or OR). Only a nonthesis program is offered.

EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision Making and Problem Solving (3)
EAd 281 Systems Analysis and Management I (3)
EAd 282 Systems Analysis and Management II (3)
EAd 287 Decision Support Systems and Models (3)
OR 201 Survey of Operations Research: Deterministic Models (3)
OR 202 Survey of Operations Research: Stochastic Models (3)

Elective Courses

Two courses are selected from course offerings of the Department of Operations Research, normally from among the following:

OR 232 Applications of Linear and Nonlinear Optimization Theory (3)
OR 251 Linear Programming (3)
OR 262 Decision Analysis (3)
OR 271 Forecasting Techniques (3)
OR 277 Queuing Theory (3)
OR 279 Inventory Control (3)

One project course is selected from the following, according to the nature of the project chosen at the end of the period of study:

EAd 297 Problems in Engineering Administration (3)
OR 291 Problems in Operations Research (3)

Professional Degree Program

The Department of Engineering Administration has established the professional degree program for those students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in systems analysis and management.

In the professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Each student's program is planned considering the student's background and needs consistent with departmental requirements.

Area of Specialization

The professional degree program in systems analysis and management provides post-master's degree graduate study in the Departments of Engineering Administration and Operations Research. With the adviser's approval, the student may select courses in other University departments to meet specific needs or objectives.

A student's program of study will provide concentration in systems analysis and management and will include courses from other areas. A program consists of a minimum of 30 semester hours of approved graduate courses beyond a master's degree, 6 of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of semester hours.

Admission

Admission to study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Engineer (in systems analysis and management), an applicant must possess a master's degree in systems analysis and management, or in an equivalent field, and a bachelor's degree in engineering. For the professional degree of Applied Scientist (systems analysis and management), an applicant must possess an appropriate bachelor's degree and a master's degree in systems analysis and management or a related field. Applicants having equivalent backgrounds of study may be considered. At least a 3.1 average in master's degree program studies is required.

Those applicants having master's degrees in fields other than systems analysis and management, or equivalent, must have basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computers. These requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. (Students may not earn graduate credit for these courses.) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission. In addition, several graduate prerequisite courses may be required: EAd 211–12, 269, 281, and OR 201–202. Neither undergraduate nor graduate prerequisite courses may be applied toward the professional degree.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of only 9 semester hours of this additional course work can be applied, with the approval of the adviser, toward meeting degree requirements.

Transfer Credit

Up to 6 semester hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a master's degree will be considered for transfer toward the professional degree. Previously earned credits must have been earned within five years of admission to candidacy for the professional degree and must be appropriate for the student's professional degree program. The student must, with the approval of the adviser, petition the Department Chairman for such transfer.

Program of Study

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission and professional degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned project or to meet other needs. With prior approval of the adviser, up to 12 semester hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 12 hours include the 6 potential transfer credits.

Professional Project

Each degree candidate must engage in a professional project on which he or she will submit an acceptable report of an analysis and solution of a real-world problem in systems analysis and management. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to work through to a solution, and to communicate the results in writing.

When the course work is essentially completed and with the adviser's approval, the candidate will register for EAd 395–96 Seminar: Professional Project (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study and prepared a written study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the Department Chairman for approval. Six semester hours are assigned for work on the professional project.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and

further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years, from the date of the student's first registration as a graduate student in prerequisite or graduate courses, to complete all degree requirements. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the professional degree program under whatever conditions and regulations are in effect at that time.

Doctor of Science Degree Program

A program in systems analysis and management leading to the degree of Doctor of Science provides advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 36–37. Applicants for Doctor of Science study in systems analysis and management must have appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study and research. They must have a master's degree with a record of superior academic achievement (at least 3.20) in systems analysis and management or an equivalent field. Applicants with other master's degrees must have knowledge of basic probability and statistics, principles of management, engineering economic analysis, and computers. The requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. The applicant may be required to complete other prerequisite courses prescribed as a condition for admission. In addition, several graduate prerequisite courses may be required: EAd 211–12, 269, 281, and OR 201–202. Credit for undergraduate and graduate prerequisite courses may not be applied toward the Doctor of Science degree.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing *all* course and language requirements and qualifying examinations (see pages 37–38). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of only 9 hours of this additional course work can be applied, with the approval of the adviser, toward meeting degree requirements.

Language Requirement

A doctoral student should maintain a broad outlook in pursuing his or her study and, therefore, must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language must be demonstrated before admission to the qualifying examination. The student must obtain approval from his or her doctoral adviser before the language is selected.

Transfer Credit

Up to 6 semester hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a master's degree will be considered for transfer toward the doctoral degree. They must have been earned within the five years preceding admission for the doctoral degree and must be appropriate to satisfy the student's doctoral degree program. The student must, with the approval of the adviser, petition the Department Chairman for such transfer.

Program of Study

In addition to the major field of systems analysis and management, a minor area of concentration is required. It may be chosen from the areas administered by this Department, the Department of Operations Research, or from appropriate areas in other departments of the University. The general requirements for doctoral study are stated on pages 36–40.

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the qualifying examination, and doctoral degree requirements. An area of study is selected to prepare the student to undertake dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs. The program of each student must be approved by his or her adviser and the Department Chairman.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on pages 38–40. Once the qualifying examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal that includes consideration of the merit of the proposed research and the adequacy of preparation to conduct it successfully. The detailed project proposal is submitted for approval to the Department Chairman and a selected faculty member, who will serve as the student's Director of Research. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 while the research is conducted.

Scholarship

A student studying for the doctoral degree must achieve a cumulative quality-point average of at least 3.40 to receive the degree. No such student may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited.

Time Limits

A full-time student in the doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 40).

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the doctoral degree program under whatever conditions and regulations are in effect at that time.

Graduate Study in Information Management

Master of Science Degree Program

The Master of Science degree is offered to students specializing in information management. The program is administered by the Department of Engineering Administration with the cooperation of the Department of Electrical Engineering and Computer Science.

More and more, information is being recognized as a major resource of modern organizations. The design and operation of systems for the efficient management of information to serve the needs of organizational managers requires knowledge of the process and techniques of management and of the technology of computers and data processing. There is a growing need for individuals who are able to apply the power of computer science to the process of management.

This program offers a blend of studies from the areas of management science and computer science. It provides insight into the problems of management, understanding of the viewpoints and techniques of managers, and an appreciation of the technology of data processing and data communications. The focus of the program is on the management of information to support effective planning and decision making in organizations.

Admission and Prerequisites

Admission to graduate study toward a master's degree requires a bachelor's degree from a recognized institution and evidence of capacity for productive work at the graduate level. In addition, applicants for the program leading to the degree of Master of Science in information management must meet the following requirements: (1) A minimum of two years of experience in data processing, data communications, or related areas. (2) Basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computer technology. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150 Introduction to Engineering Administration, EAd 160 Introduction to Engineering Economic Analysis, EAd 170 Basic Quantitative Methods for Engineering Administration, and CSci 100 Introduction to Computer Science. A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Science. Unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Required Courses

Only a nonthesis program is offered.

EAd 211 Engineering Administration I
EAd 212 Engineering Administration II
EAd 269 Elements of Decision Making and Problem Solving
EAd 251 Management Information Processing Resources
EAd 254 Automatic Data Processing Systems
EAd 321 Management Information Systems
EAd 297 Problems in Engineering Administration
CSci 158* Algorithmic Methods (or CSci 201, which requires familiarity with assembly language programming)
CSci 159* Programming and Data Structures (requires prior knowledge of assembly language programming)

Elective Courses

Two courses are to be selected from among the following course offerings:

CSci 222 Design of User–Computer Dialogues
CSci 229 Security and Privacy in Computer Systems
CSci 227 Management Information Systems and Database Management
CSci 244 Data Communications
EAd 287 Decision Support Systems and Models
EAd 295 Management of Technical Information

Professional Degree Program

The Department of Engineering Administration has established the professional degree program for those students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material

* Taken for graduate credit.

rather than research. The program leads to the degree of Applied Scientist or Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in information management.

In the professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with the flexibility to adapt successfully to changing circumstances. Each student's program is planned considering his or her background needs and consistent with departmental requirements.

The professional degree program in information management provides post-master's graduate study in the Departments of Engineering Administration and Electrical Engineering and Computer Science. With the approval of his or her adviser, the student may select courses in other University departments to meet specific needs or objectives.

A student's program of study will provide concentration in information management and include courses from other areas. A program consists of a minimum of 30 semester hours of approved graduate courses beyond a master's degree, 6 of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of semester hours.

Admission

Admission to study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Applied Scientist (in information management), an applicant must possess a master's degree in computer science, information management, or engineering administration. For the professional degree of Engineer, an applicant must possess a bachelor's degree in engineering. Applicants with equivalent backgrounds of study may be considered. At least a 3.20 average in master's degree program studies is required. Those applicants with master's degrees in equivalent fields must have basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computer science. These requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, 160, 170, and CSci 100. (Students may not earn graduate credit for these courses.) The applicant may be required to complete other undergraduate or graduate prerequisite courses prescribed as a condition for admission.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of only 9 semester hours of this additional course work can be applied, with the approval of the adviser, toward meeting degree requirements.

Transfer Credit

Up to 6 semester hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a master's degree will be considered for transfer

toward the professional degree. Previously earned credits must have been earned within five years of admission to candidacy for the professional degree and must be appropriate for the student's program. Transfer credits may not be granted for courses applied toward meeting the requirements of any degrees previously awarded. The student must, with the approval of his or her adviser, petition the Department Chairman for such transfer.

Program of Study

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission and professional degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of concentration should be selected to prepare the student to undertake the professional project, and courses should be selected to support work on the planned project. With prior approval of the adviser, up to 12 semester hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 12 hours include the 6 potential transfer credits.

Professional Project

Each degree candidate must engage in a professional project on which he or she will submit an acceptable report of an analysis and solution of a real-world problem in information management. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to work through to a solution, and to communicate the results in writing.

When the course work is essentially completed and with the adviser's approval, the candidate will register for EAd 395–96 Seminar: Professional Project (3–3) to receive guidance in the professional project. Before registration for this seminar, the candidate should have tentatively identified a project to study and have prepared a study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the Department Chairman for approval. Six semester hours are assigned for work on the professional project. No grade is assigned for these hours until completion of the project report, which will be judged as acceptable or nonacceptable. Approval of two regular faculty members, one of whom may be the project adviser, is required for acceptance of the project final report, which will result in a grade of Credit for the course semester hours.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.10 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years, from the date of the student's first registration as a graduate student in prerequisite or graduate courses, to complete all degree requirements. A part-time student in this program is allowed a maximum of

five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Doctor of Science Degree Program

A program in information management leading to the degree of Doctor of Science provides advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 36–37.

Applicants for the Doctor of Science degree in information management must have appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study and research. They must have a master's degree with a record of superior academic achievement (at least 3.40) in computer science, information management, engineering administration (information management area of concentration), or an equivalent field. Applicants with master's degrees in equivalent fields must have knowledge of basic probability and statistics, principles of management, engineering economic analysis, and computers. The requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, 160, 170, and CSci 100. The applicant may be required to complete other prerequisite courses prescribed as a condition for admission. In addition, several graduate prerequisite courses may be required. Credit for undergraduate and graduate prerequisite courses may not be applied toward the Doctor of Science degree.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing all course and language requirements and qualifying examinations (see pages 37–38). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of only 9 semester hours of this additional course work can be applied, with the approval of the adviser, toward meeting degree requirements.

Language Requirement

A doctoral student should maintain a broad outlook in pursuing his or her study and, therefore, must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language must be demonstrated before admission to the qualifying examination. The student must obtain approval from his or her doctoral adviser before the language is selected.

Transfer Credit

Up to 6 semester hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a master's degree will be considered for

transfer toward the doctoral degree. They must have been earned within the five years preceding admission for the doctoral degree and must be appropriate to the student's program for the doctoral degree. The student must, with the approval of his or her adviser, petition the Department Chairman for such transfer.

Program of Study

An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs. The program of study for each student must be approved by the student's adviser and the Department Chairman.

In addition to the major field of information management, a minor area of concentration is required. It may be chosen from the areas administered by the Engineering Administration Department and the Department of Electrical Engineering and Computer Science or from appropriate areas in other departments of the University. The general requirements for doctoral study are stated on pages 36–40.

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the qualifying examination, and doctoral degree requirements. An area of study is selected to prepare the student to undertake the dissertation research, and courses are selected either to support work on the dissertation or to meet other needs. The program of each student must be approved by the student's adviser and the Department Chairman.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on pages 38–40. Once the qualifying examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal that includes consideration of the merit of the proposed research and the adequacy of his or her preparation to conduct it successfully. The detailed project proposal is submitted for approval to the Department Chairman and a selected faculty member, who will serve as the student's Director of Research. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 while the research is conducted.

Scholarship

A student studying for the doctoral degree must achieve a cumulative quality-point average of at least 3.40 to receive the degree. No such student may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited.

Time Limits

A full-time student in the doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an

unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 40).

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the doctoral degree program under whatever conditions and regulations are in effect at that time.

Engineering Administration Computer Laboratory

A computer laboratory is provided for the primary use of Engineering Administration students. This laboratory is intended to give hands-on experience in the use of computers as a management tool. To this end the focus of the laboratory is on the use of microcomputers and user-friendly management software programs. When additional computing power is needed, however, the microcomputers can be used as reactive terminals with minicomputers in the School of Engineering and Applied Science and with the University's mainframe computer processing unit. The laboratory is also used for research to further develop decision support systems for management and to explore computer-aided teaching in management education.

Engineering Administration Undergraduate Courses

150 **Introduction to Engineering Administration** (3)
The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to study of the complete management process in EAd 211–12. (Fall, Spring, Summer)

160 **Introduction to Engineering Economic Analysis** (3)
Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit-cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. (Fall, Spring, Summer)

170 **Basic Quantitative Methods for Engineering Administration** (3)
An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research. (Fall, Spring, Summer)

Engineering Administration Graduate Courses

204 **Administration of Engineering Contracts** (3)
Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and adminis-

tration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and Spring)

207 **The Personnel Function for Engineering Administrators** (3)
Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment. (Fall)

210 **Engineering Law** (3)
Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and development contracts. (Fall and Spring)

211–12 **Engineering Administration** (3–3)
Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, 160, or equivalent. (Fall, Spring, Summer)

214 **Patent Law** (3)
A comprehensive and systematic introduction to the law of patents, trade secrets, trademarks, and copyright, including the preparation and prosecution of patent applications. Management decisions involving intellectual property rights. The role of the research administrator in preserving and perfecting legal rights in innovations. (Spring)

215 **Ethical Issues in Engineering Administration** (3)
Moral philosophy from which ethical considerations are derived; ethical issues and exemplary problems encountered in the administration of engineering and allied areas of human endeavor. Use of case study method to enhance student's ability to recognize ethical aspects of problem situations and to think analytically and synthetically about such aspects. (Spring)

221 **Environmental Management** (3)
The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment and the use of our resources. Review of governmental and industrial programs to combat pollution of the air, land, and water. Review of existing and pending legislation involving environmental and related energy matters; theoretical aspects of specific management problems; tools for assessing environmental impact; institutional designs; procedures for promoting public participation. (Fall)

222 **Energy Management** (3)
Designed for those interested in management of energy supply and demand including petroleum, natural gas, coal, nuclear, conservation, and unconventional forms. Topics include energy legislation; theoretical aspects of pricing and scarcity doctrine; instruments for energy policy; hard, soft, and balanced energy paths; social legal institutional barriers to new technologies in extraction, processing, and utilization. Attention is given to combating scarcity, using methods that have the least cost and environmental impact. (Spring)

231 **Program Management** (3)
Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases. (Spring)

241 **Construction Management I** (3)
Types of construction procurement; aspects of contracts and specifications important to project management, subcontracting; project income; insurance; bonds; mechanics' liens. (Fall)

242 **Construction Management II** (3)
Administration of construction projects: planning, scheduling, control, resource allocation, and least cost expediting (CPM and PERT techniques). Labor relations; project safety (OSHA). (Spring)

243 **Construction Management III** (3)
Managerial problems associated with construction; optimal contractor decision making; modeling and systems approach to construction management; the search for projects; selection of projects, bidding strategy. (Fall)

251 **Management of Information Processing Resources** (3)
Introduction to analysis, design, and implementation of on-line management information systems, including feasibility studies, requirements analysis, specifications, hardware and software considerations, performance evaluation, implementation plans, and postmortem considerations. Elements of information processing technology, including data transmission and computer networking. Consideration of time sharing, facilities management, stand-alone computers, service bureaus, centralization vs. decentralization, with emphasis on the use of micro- and minicomputers in distributed processing. (Fall)

253 **Production Management** (3)
Planning, organizing, and control of production; forecasting techniques; materials management; methods of loading and scheduling production processes; electronic methods in production control. Organization and administration of the plant engineering function with emphasis on maintenance control programs. (Spring)

254 **Automatic Data Processing Systems** (3)
Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision making, business, and society. (Spring)

255 **Administration of Research and Development** (3)
The study of technological innovation as a vital part of the organizational adaptation process; the role of the technical manager in using organization, planning, and motivation to accomplish research and development objectives. (Fall)

261 **Economic Analysis in Engineering Planning** (3)
Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy; permission of instructor. (Fall and Spring)

262 **Finance for Engineers** (3)
Exposition of the financial concepts encountered in engineering situations: financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation. (Fall)

265 **Transportation Management I** (3)
Integration of social, technical, economic, and political considerations that shape transportation systems and their management. Focus on modal histories and relative advantages. (Fall)

266 **Transportation Management II** (3)
Intergovernmental relations, regulatory process, property acquisition, cost recovery, condemnation, labor standards, environmental laws applicable to transportation, citizen participation, and land use regulations. Current topics in management and the legal process in both government and private sectors. (Spring)

269 **Elements of Decision Making and Problem Solving** (3)
Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Model building, testing, solving. Replacement under certainty or risk. Control—general, control charts, sampling inspection. Experimentation to differentiate variables, build models—canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations. Prerequisite: EAd 170 or equivalent. (Fall, Spring, Summer)

281 **Systems Analysis and Management I** (3)
The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. (Fall)

282 **Systems Analysis and Management II** (3)
Extension and elaboration of systems analysis techniques, including their application to industry, input–output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281 or permission of instructor. (Spring)

283 **Systems Engineering** (3)
Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques. (Fall, odd years)

285 **Seminar: Administrative Problems** (3)
Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit. (Fall and Spring)

287 **Decision Support Systems and Models** (3)
Intended to expose managers to decision tools and the modeling process and modelers system designers to the decision maker's perspective. Impact of human behavioral, managerial, and situational factors on choice of computer-based technique; simplified models. Review of theory, languages, and methods in system modeling and artificial intelligence. Management of the modeling process including predesign, software costing (make or buy), development, verification, validation, and implementation cycles. Case studies. (Fall)

288 **Technology Issue Analysis** (3)
A seminar for technical managers who need the contextual background and intellectual basis for addressing technology issues in the public and private sectors. Technology impact assessment, technology forecasting, technology innovation, and the principles and practices of technology transfer as elements of a systematic approach to informed choice and sound technology decisions. (Fall)

291 **Structured Analysis of Management Problems** (3)
Application of each phase of a structured problem-solving approach to small-scale management problems. Determination of problem symptoms; definition of problems; selection of a problem; determination of constraints on solutions and alternative feasible solutions; development of the solutions and selecting one, testing it, planning controls on it, and planning its implementation. Prerequisite: EAd 269. (Spring, even years)

293 **Technical Enterprises** (3)
Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and within government who depend on technical firms as suppliers. (Fall)

294 **Marketing of Technology I** (3)
Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 **Management of Technical Information** (3)
Needs and objectives of technical information systems, functions involved in technical information, storage and retrieval, abstracting, computer usage in technical information systems, system organization. Prerequisite: EAd 251 or permission of instructor. (Spring)

297 **Problems in Engineering Administration** (3)
Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. Open to master's degree candidates in the Department. (Fall, Spring, Summer)

298 **Research** (arr.)
Basic or applied research in engineering administration or systems analysis. May be repeated for credit. Open to master's degree candidates in the Department. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

311 **Marketing of Technology II** (3)
Special attention to marketing research, negotiation, and international marketing. Required for master's degree candidates in the marketing of technology program. Prerequisite: EAd 294 or permission of instructor. (Fall, even years)

321 **Management Information Systems** (3)
Study of the development and management of information systems used by middle and higher management of technological and scientific organizations to control the many facets of the organization at all managerial levels. Required for master's degree candidates in the information systems management program. Prerequisite: EAd 295 or permission of instructor. (Fall, even years)

386 **Advanced Topics in Management** (3)
Reading and discussion of classical and important recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 **Technological Forecasting** (3)
Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

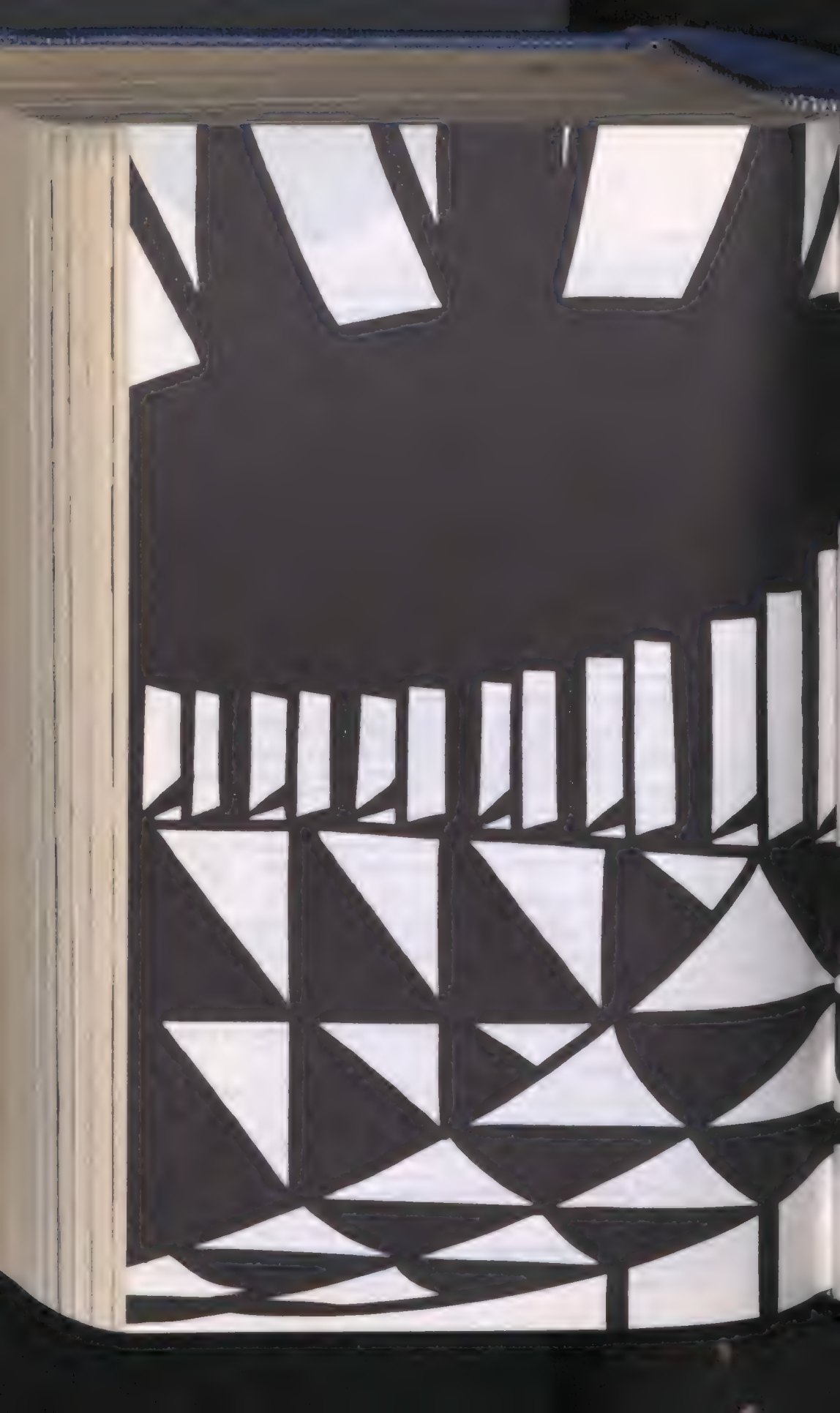
388 **Cost Effectiveness** (3)
Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost effectiveness studies, systems approach to cost effectiveness studies. (Spring, even years)

394 **Advanced Study** (arr.)
Limited to Departmental professional degree students. May be repeated for credit. (As arranged)

395–96 **Seminar: Professional Project** (3–3)
Limited to professional degree candidates in the Department. (Fall and Spring)

398 **Advanced Reading and Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)



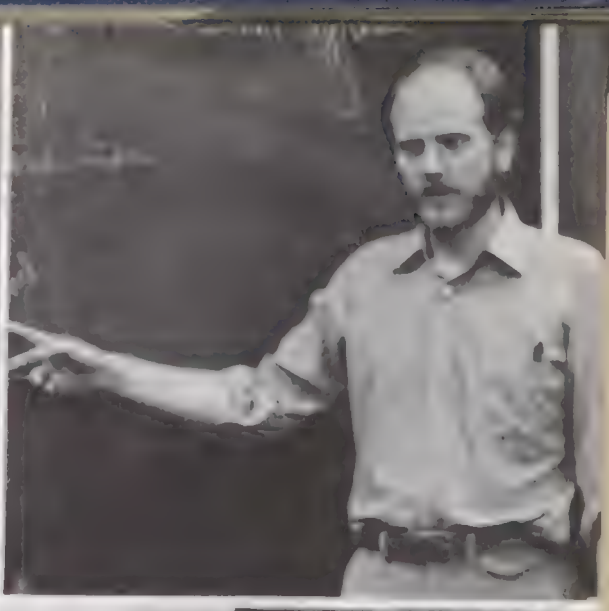

Operations
Research



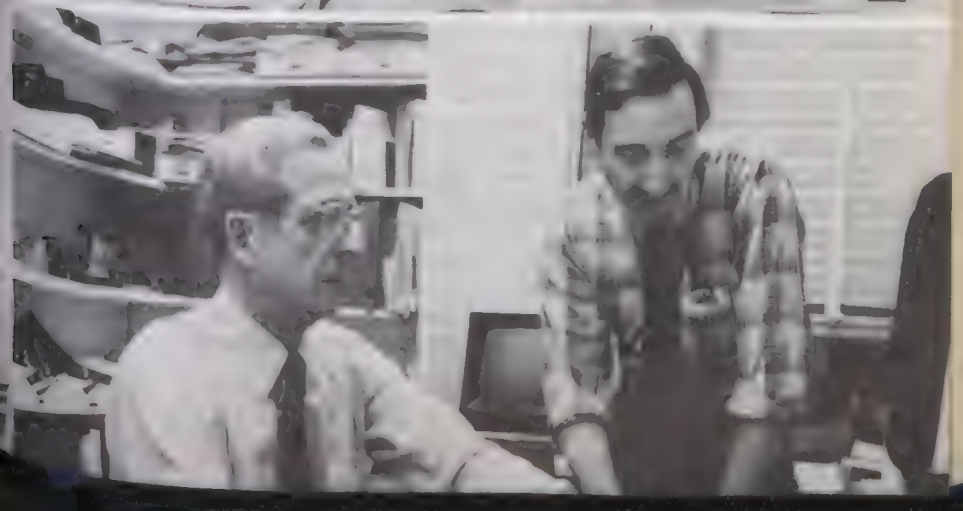












Operations Research

Professors W.H. Marlow, D. Gross *(Chairman)*, N.D. Singpurwalla, A.V. Fiacco, G.P. McCormick, J.E. Falk, R.M. Soland, R.H. Clark *(Research)*
Adjunct Professor F. Frishman
Professorial Lecturers C. Anello, W.R. Nunn, B.L. Schwartz, S.C. Tignor, G.R. McNichols, J.W. Blankenship, J.D. Waller, N.D. Glassman, A.L. Haines, D.R. Edmonds
Associate Professor D.R. Miller
Associate Professorial Lecturers P.J. Evanovich, K.R. Hoffman, J.F. Ince, J.W. Johnson, B.D. Nussbaum, P.F. McCoy, W.P. Hutzler, S.E. Nevius, H.S. Balaban, J.A. Berning, Jr.

Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, and Doctor of Science and to the professional degree of Applied Scientist.

Operations Research and Computational Science Program—Undergraduate Study

Operations research and computational science is the application of scientific methods and engineering techniques to the solution of management problems, especially where the most efficient and effective use of resources is concerned. Its practitioners seek to observe, understand, and predict the behavior of man–machine systems so that the best decisions about these systems can be made.

Operations research and computational science, as an applied scientific discipline, has a body of specialized methods and theories that are used to design, analyze, and improve operational and managerial systems. It is actually an interdisciplinary field—a synthesis of many disciplines that has evolved into an interesting and exciting field of its own. It combines many of the techniques and theories of engineering, mathematics, computer science, statistics, management, and economics.

In today's complex technological world, those trained in operations research and computational science are increasingly called upon by managers and decision makers to help in the analysis and solution of the many-faceted problems that arise in such diverse areas as transportation, scheduling, distribution, production, inventory control, information systems, manpower planning, health care systems, crime and fire fighting, environmental planning, energy economics, system reliability, forecasting, and strategic planning. It is safe to say that people with such training are now being employed by every major corporation, every major government agency, and every major military command in the United States.

The significant features of operations research and computational science are the broad range of potential applications and the wide variety of scientific techniques that can be selected and combined for a multidisciplinary approach. These characteristics merge to make the profession a dynamic and vital one. Operations research and computational science should be seriously considered by those who are attracted to the use of mathematics, statistics, engineering, and science in solving decision problems of practical significance.

Core Curriculum

The first four semesters of work concentrate on the fundamentals of science and mathematics and also include study in English, the humanities, and the social sciences.

During the last four semesters, the student concentrates on the professional courses in operations research, computer science, engineering administration, mathematics, and statistics. In addition, an average of one technical elective per semester must be chosen, and the student may choose *sets* of electives that would allow concentration in areas such as engineering, mathematics, statistics, environmental science, management, and so forth, depending on his or her special interests:

First Semester

CSci 55: Introductory Computer Programming (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

Chem 13: General Chemistry (4)
CSci 52: Computers and Societal Problems (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
CSci 158: Algorithmic Methods and High-Level Languages (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
ApSc 115: Engineering Analysis III (3)
Math 124: Introduction to Matrix Theory (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

Fifth Semester

ApSc 116: Engineering Analysis IV (3)
CSci 157: Machine and Assembly Language Programming (3)

CSci 161: Discrete Structures for Computing (3)
OR 101: Survey of Operations Research: Deterministic Models (3)
Stat 187: Introduction to Sampling (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 159: Programming and Data Structures (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
OR 102: Survey of Operations Research: Stochastic Models (3)
Stat 118: Regression Analysis (3)
Elective: Selected from humanities or social sciences (3)
Elective: *One* technical elective selected from:
ApSc 199: Honors Research Project and Seminar (3–3)
Acct 51: Introductory Accounting I (3)
BAd 191: Fundamentals of Management (3)
EE 11: Linear Networks I (3)
Math 113: Graph Theory (3)
ME 126: Fluid Mechanics (3)
ME 131: Thermodyamics (3)
Stat 188: Nonparametric Statistical Inference (3)

Seventh Semester

CSci 155: Introduction to Numerical Methods for Computers (3)
OR 151: Linear Programming (3)
OR 190: Applied Operations Research and Computational Science
Stat 181: Applied Time Series Analysis (3)
Elective: *One* technical elective selected from:
ApSc 199: Honors Research Project and Seminar (3–3)
Acct 52: Introductory Accounting II (3)
BAd 140: Basic Marketing Management (3)
CE 193: Hydraulics (3)
CSci 151: Introduction to Systems Programming I (3)
CSci 177: Programming for Management Systems (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
Math 121: Introduction to Abstract Algebra (3)
Math 139: Advanced Calculus I (3)
ME 176: Environmental Engineering Problems (3)

Eighth Semester

EAd 150: Introduction to Engineering Administration (3)
OR 191: Problems in Operations Research (3)
Stat 119: Analysis of Variance (3)
Electives: *Two* technical electives selected from:
ApSc 199: Honors Research Project and Seminar (3–3)
BAd 120: Business Finance (3)
BAd 123: Investment and Portfolio Management (3)
BAd 154: Transportation and Logistics Management (3)
BAd 193: Managing Production/Operations (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
CSci 156: Introduction to Systems Programming II (3)
CSci 178: Introduction to Database Management (3)
EE 32: Fields and Waves II (3)
EE 172: Control Systems Design (3)
Math 122: Introduction to Abstract Algebra (3)
Math 140: Advanced Calculus II (3)
Math 157: Introduction to Complex Variable Theory (3)

ME 148: Thermodynamic Analysis (3)
Stat 188: Nonparametric Statistical Inference (3)

Postgraduate Work

Upon completion of the four-year degree program, the student may choose to study one more year and obtain a Master of Science degree in operations research. Graduates of the operations research and computational science curriculum are given two semester hours of advanced standing that are applicable to the master's program.

Operations Research Undergraduate Courses

101 **Survey of Operations Research: Deterministic Models** (3)
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks; game theory. Prerequisite: Math 33 or equivalent. (Fall and Spring)

102 **Survey of Operations Research: Stochastic Models** (3)
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: Math 33, ApSc 115, or equivalent. (Fall and Spring)

151 **Linear Programming** (3)
Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems, simplex procedures; duality problems; parametric linear programming and sensitivity analysis; transportation problems. Prerequisite: OR 101 or permission of instructor. (Fall and Spring)

190 **Applied Operations Research and Computational Science** (3)
Use of existing computer software and development and use of student's computer programs to solve problems in operations research and computational science. Analysis and solution of case studies and design problems. Use of Engineering Administration Operations Research Computer Laboratory. Prerequisite: CSci 158, OR 101 and 102. (Fall)

191 **Problems in Operations Research** (3)
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. Prerequisite: knowledge of FORTRAN or BASIC. (Fall and Spring)

Master of Science Degree Program

The objective of the master's program in operations research is to prepare students with appropriate undergraduate backgrounds for in-depth study of analytically oriented techniques of management decision making and applications of these techniques.

Expanded scientific, statistical, and mathematical knowledge combined with growing needs in technological as well as social areas have created increased demand for individuals trained in operations research. The discipline of operations research uses scientific principles supported by statistical and mathematical methodology to study the function and structure of complex industrial, military, and social systems in an effort to evaluate the probable effects of proposed courses of action, to establish criteria to judge the effective-

ness of these courses, and to assist in making optimal decisions. The program in operations research provides a scientific basis for solving problems involving the interaction of many factors and organizational components in the interest of the whole system. This breadth of interest is an example of the systems approach in the sense that a system is an interconnected complex of functionally related components. Most operations research efforts begin with specific aspects of a general problem and proceed to consideration of the system as a whole. Just as the engineer may start with the study of subsystems or components of a general problem, so may the operations research analyst.

Admission

In addition to the requirements for admission to graduate study (see pages 28–29), the applicant for the program in operations research leading to the Master of Science degree must have adequate knowledge of probability and statistics and computer programming. This requirement can be met by satisfactory completion of ApSc 115, 116, and CSci 51 or approved equivalents. It is generally possible to take these courses concurrently with courses taken for graduate credit; however, these undergraduate courses do not fulfill any part of the requirements for the master's degree.

Required Courses

Core courses required in the field of operations research are OR 201, 202, 209, 210, and 299–300 (for those electing a thesis) or 291 (for those not electing a thesis). Students must complete OR 201, 202, 209, and 210 before attempting any other courses; in certain cases, however, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of the program. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research. Appropriate courses from other departments of the University may also be approved as electives.

Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both students interested in applications and those interested in theory. Specific areas of concentration and suggested departmental electives follow.

General Operations Research

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 261: Theory of Games
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the Department may be elected.

Defense Science

OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 262: Decision Analysis
OR 273: Digital Systems Simulation
OR 281: Reliability Theory I

Energy Systems

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

Logistics Engineering

OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Business Administration, Management Science, and Electrical Engineering and Computer Science.

Management Science

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Departments of Business Administration, Economics, Engineering Administration, and Management Science.

Mathematical Modeling in Information Systems

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

Mathematical Optimization

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer, Network, and Dynamic Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

Model Building for Transportation Flows

OR 231: Theory of Traffic Flow
OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning and from the National Law Center.

Operations Research in Industrial Engineering Systems

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

Quantitative Decision Making for Public Policy

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

Stochastic Modeling

OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

Professional Degree Program

This program of advanced study and research leads to the degree of Applied Scientist. The program is designed to provide an educational opportunity for students interested in pursuing post-master's study with emphasis on applied subject matter rather than on basic research.

Admission

In addition to the general requirements for admission to professional degree study (see pages 34–35), admission requires an appropriate master's degree from a recognized institution and evidence of a capacity for productive work as indicated by prior scholarship. The applicant must also possess a bachelor's degree in engineering, mathematics, or administration. In certain cases, applicants having an equivalent quantitative background may be considered for admission by the Department.

Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-Department minor. A minimum of 30 semester hours is required to earn the professional degree. This 30-hour minimum includes (a) a minimum of 12 hours in operations research, (b) Stat 201–202, (c) a 3-hour professional degree project (OR 391), and (d) a 9-hour applied minor in a field other than operations research. Appropriate minor areas include economics; engineering administration; systems analysis; computer science; systems science, networks, and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems. Professional degree candidates in operations research must pass the Department's Master's Comprehensive Examination (MCE) before their final program of study can be approved. Full-time students are advised to attempt the MCE within one year of their admission; all students must take the examination within two years. Extensions are permissible at the Department's discretion.

Doctor of Science Degree Program

Programs in operations research leading to the degree of Doctor of Science provide advanced study and research to enable students to extend their fields of knowledge and to enhance their career opportunities in research, analysis, management, administration, or education.

Admission

In addition to the general requirements for admission to doctoral study (see pages 36–37), the applicant for the doctoral program in operations research must have a master's degree, with a superior record of academic achievement. Outstanding professional performance is also considered in evaluating applicants.

Language Requirement

No foreign language is required for the Doctor of Science degree program in operations research. A proficiency in one computer programming language must be demonstrated before the student is admitted to the doctoral qualifying examination.

Programs of Study

Doctoral programs are planned so that the student may obtain adequate breadth in operations research and sufficient depth in areas of specialization, which will enable the completion of a dissertation that will be a significant contribution to the field. Possible areas of study include mathematical programming, multicriteria decision making, inventory, queuing, and reliability. In addition to the major in operations research, two minor areas of concentration are normally required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from within the Department or from appropriate other departments of the University, such as Business Administration; Civil, Mechanical, and Environmental Engineering; Economics; Electrical Engineering and Computer Science; Engineering Administration; Health Care Administration; Management Science; and Urban and Regional Planning. Incoming doctoral candidates will normally be required to take the department's Master's Comprehensive Examination (MCE) and must demonstrate superior performance on that examination before final approval of the program of study can be granted. All doctoral candidates must attempt the MCE within two years of their admission; full-time students usually take it within one year. Extensions may be granted, at the discretion of the Department. The general requirements for doctoral study are stated on pages 36–40).

Professional Fields and Research Interests of Operations Research Faculty

	Areas of Specialization	Areas of Recent Research
Rolf H. Clark	Capital budgeting Feedback modeling Managerial economics Policy analysis	Cost/benefit analysis Cost estimating and analysis Manpower planning Military planning
James E. Falk	Mathematical programming Numerical methods Mathematical modeling	Nonconvex programming Sequential optimization problems Sequential games Application of optimization methods to economics, military, logistics, and location problems
Anthony V. Fiacco	Mathematical programming Numerical methods Mathematical modeling Stability analysis	Penalty function methods Approximation and sensitivity analysis in nonlinear programming Parametric solution and bounding techniques Applications to water pollution, structural design, energy, and manpower

	Areas of Specialization	Areas of Recent Research
Donald Gross	Inventory theory Queuing theory Simulation	Queuing approximations Inventory models Closed queuing networks
W.H. Marlow	Mathematical methods and numerical procedures in operations research and management science	Logistics Systems effectiveness
Garth P. McCormick	Mathematical programming Numerical methods Mathematical modeling	Rate of convergence of algorithms Nonconvex programming Mathematical programming applied to pollution problems and conservation of resources Energy modeling
Douglas R. Miller	Applied probability Stochastic processes Simulation Mathematical statistics	Risk analysis Avionics maintenance models Statistical inference using empirical distributions Stochastic models in polymer engineering Algorithms for solving queuing and inventory models Software reliability
Nozer D. Singpurwalla	Applied probability and mathematical statistics Reliability theory and applications Time series analysis and forecasting Fault tree analysis Kalman filtering and its applications	Applications of time series analysis to reliability problems Bayesian theory and methodology Extreme value theory and applications Nonparametric characterizations of distributions and their testing Software reliability Maintenance policies
Richard M. Soland	Mathematical modeling Decision theory Mathematical programming	Optimal facility location Interactive multiple criteria optimization Multiple criteria decision models in the public and private sectors Solution and applications of structured integer programming problems Discrete optimization in stochastic systems

Operations Research Graduate Courses

201 **Survey of Operations Research: Deterministic Models** (3)
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming, networks, game theory. Prerequisite: Math 33 or equivalent (Fall and Spring)

202 **Survey of Operations Research: Stochastic Models** (3)
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: Math 33, ApSc 115, or equivalent. (Fall and Spring)

209 **Mathematics in Operations Research I** (3)
Fundamental methods and practical procedures for deterministic decision models in operations research involving a number of variables. Applications of linear models for resource allocations. Applications to data representation and algorithmic procedures for linear and nonlinear optimization models. Applications of linear algebra and real multivariate analysis. Prerequisite: Math 33 or equivalent. (Fall and Spring)

210 **Mathematics in Operations Research II** (3)
Fundamental methods and practical procedures for stochastic decision models in operations research involving applications of complex variables. Applications of linear differential, difference, and differential-difference systems to various areas in operations research. Applications of modern numerical methods. Prerequisite: Math 33 or equivalent. (Fall and Spring)

231 **Theory of Traffic Flow** (3)
Definitions and measurement of traffic stream parameters, dynamic theories. Follow-the-leader models of traffic flow, kinematic theories and fluid analogies, traffic cybernetics, statistical distributions and queuing theory, stochastic approaches to static delay problems, simulation of traffic problems. Prerequisite: ApSc 115 and Math 33, or equivalent (Spring, odd years)

232 **Applications of Linear and Nonlinear Optimization Theory** (3)
Introduction to penalty function methods for solving linear and nonlinear optimization problems through use of existing computer codes. Formulation of optimization models in application areas of structural design, nutrition, pollution control, inventory control, energy, economics, psychology, statistics, and chemical processes. Admission by permission of instructor. Prerequisite: Math 33 or equivalent. (Fall)

235 **Analytic Methods for Management and Policy I** (3)
For graduate students in fields other than engineering and operations research. Various quantitative techniques such as simulation, statistics, cost-benefit analysis, cash flows and discounting, mathematical programming, difference equations, and their roles in policy analysis are presented in a theoretical context and viewed in terms of their utility in the management policy spectrum. Prerequisite: Stat 51 or equivalent (As arranged)

236 **Analytic Methods for Management and Policy II** (3)
For graduate students in fields other than engineering and operations research. An applied course using manual and computer routines to explore, through case studies, techniques in optimization and statistical analysis. The former stresses applications of mathematical programming; the latter, estimation and regression analysis. Reviews theory (and requires application) of policy simulation techniques, including growth theory, system dynamics, and stock flow analysis. Prerequisite: OR 235 (As arranged)

237 **Logistics Planning** (3)
Quantitative methods in model building for logistics systems including organization, procurement, transportation, inventory, maintenance, and their interrelationships. Stresses applications. Prerequisite: ApSc 115, Math 33, or equivalent. (Spring, even years)

251 **Linear Programming** (3)
Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis; transportation problems. Prerequisite: OR 201 or permission of instructor. (Fall and Spring)

252 **Nonlinear Programming I** (3)
Basic topics in optimization theory, including first- and second-order optimality criteria, convexity, duality, and algorithms. Methods for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications. Prerequisite: OR 201 or permission of instructor. (Spring)

253 **Integer, Network, and Dynamic Programming** (3)
Methods and applications of optimization problems requiring integral solutions. Cutting plane methods, branch and bound methods, group theoretic methods. Dynamic programming. Network programming: shortest route problems, max flow problems. Prerequisite: OR 201, 251; or permission of instructor. (Fall, even years)

261 **Theory of Games** (3)
Study of mathematical models with applications to the relationships among independent competitive entities (persons or organizations in environment of competition, bargaining, bidding), selection of optimum strategies, mini–max concept, connections with linear programming and decision functions, two-person and *n*-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

262 **Decision Analysis** (3)
Study of decision making under certainty and uncertainty and under one and several criteria. Decision analysis and decision trees, the value of information, subjective probability and Bayesian statistics, utility and value theories, multiple criteria decision making and multiple criteria optimization, goal programming, and group decision making. Some specific applications and practical aspects of decision making will also be treated. Prerequisite: ApSc 116, OR 201, 202; or permission of instructor. (Spring, odd years)

271 **Forecasting Techniques** (3)
Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box–Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Application to engineering, business, and economic situations, using special computer program packages. Prerequisite: ApSc 116, OR 202; or equivalent. (Fall, odd years)

273 **Digital Systems Simulation** (3)
Monte Carlo simulation of discrete stochastic models. Modeling complex operations research systems. Simulation languages. Random number and random deviate generation. Statistical design and analysis of simulation experiments. Validation of simulation models. Applications include queuing, inventory, scheduling, and computer models. Prerequisite: ApSc 116, OR 202, CSci 51; or equivalent; or permission of instructor. (Spring)

275 **Introduction to Scheduling** (3)
Theory of scheduling with emphasis on industrial applications, assembly line balancing, sequencing and scheduling of jobs in machine shops. Mathemati-

cal optimization, heuristic programming, and computer simulation approaches to these problems are examined. Prerequisite: OR 201, 202, 251; or permission of instructor. (Spring, even years)

277 **Queuing Theory** (3)
Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth-death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and service patterns. Model building, basic solution techniques, and formal theoretical developments. Prerequisite: ApSc 116, OR 202, or permission of instructor. (Spring)

279 **Inventory Control** (3)
Application of mathematical techniques to decisions regarding when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints. Demand uncertainty and forecasting in inventory models. Prerequisite: OR 201, 202; or permission of instructor. (Fall)

281 **Reliability Theory I** (3)
Topics introducing the mathematical and statistical theories of reliability. Mathematical theory: theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, and bounds and inequalities. Statistical theory: probabilistic derivation of failure models; testing goodness of fit; censored, truncated, and sequential life testing procedures using classical and Bayesian techniques, testing reliability hypotheses and their applications in the commonly used military standard plans. Prerequisite: ApSc 116, OR 202; or equivalent. (Fall)

291 **Problems in Operations Research** (3)
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. Prerequisite: Knowledge of FORTRAN or BASIC. (Fall and Spring)

297 **Special Topics in Operations Research** (3)
Selected topics in operations research, as arranged. Prerequisite: permission of instructor. May be repeated for credit.

298 **Research** (arr.)
Basic or applied research in operations research. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

351 **Advanced Topics in Mathematical Programming** (3)
Special topics selected from fractional and geometric programming, branch-and-bound methods, max-min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 **Nonlinear Programming II** (3)
Convex analysis, algorithmic convergence, and rate of convergence. Proofs of optimality conditions. Factorable programming and other problems with special structures. Matrix methods, sensitivity analysis, and nonconvex optimization. Prerequisite: OR 252 or permission of instructor. (Fall)

371 **Advanced Topics in Forecasting** (3)
Continuation of OR 271 for those who wish to develop further capability in this area. Brief review of OR 271, estimation of parameters of Box-Jenkins models, transfer function models for relating two or more time series, models for intervention analysis, and models for feedforward and feedback control schemes. Other techniques and concepts useful in forecasting, such as

spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or equivalent, or permission of instructor. (Spring, even years)

377 **Advanced Stochastic Models in Operations Research** (3)
Selected applied probability models, including the Poisson process, renewal theory, Markov chains, semi-Markov processes, regenerative processes, and continuous-time denumerable-state Markov processes. Applications to queues, inventories, and other operations research systems. Special topics. Prerequisite: ApSc 116, OR 277, or permission of instructor. (Fall)

381 **Reliability Theory II** (3)
Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, stochastic majorization and its applications, and reliability theory for multistate components. Statistical theory includes total time on test processes and plots, goodness-of-fit tests using total time on test plots, estimation and forecasting failure rates, and comparison of stochastic processes. Prerequisite: OR 281. (Spring, odd years)

391 **Project for Professional Degree** (3)
Limited to students in the professional degree program. (Fall and Spring)

397 **Advanced Topics in Operations Research** (3)
Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (Fall and Spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)



Required Courses in Engineering Undergraduate Curricula Offered by Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences

For convenience, descriptions of required courses in undergraduate curricula offered by Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences are listed here. See the *Undergraduate and Graduate Programs Bulletin* for elective courses in the humanities and social sciences.

Biochemistry

221–22 **General Biochemistry** (3–4)
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

Biological Sciences

Biology

11–12 **Introductory Biology for Science Majors** (4–4)
Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles demonstrated through consideration of the plant as an organism. BiSc 12: Beginning principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Materials fee, $24 per semester. (Academic year)

Zoology

145 **Principles of Development** (4)
Lecture (2 hours), laboratory (4 hours). Development of animals, especially vertebrates, with reference to human embryos. Principles are illustrated by modern experimental studies of developmental problems. Laboratory analysis of organ system formation in the frog, chick, and pig. Materials fee, $24. (Fall; Spring, even years)

148 **Histology** (4)
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Materials fee, $24. (Spring; Fall, odd years)

Chemistry

13 **General Chemistry** (4)
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium, liquid and solid states; periodicity; electrochemistry, organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $35. (Fall and Spring)

22 **Introductory Quantitative Analysis** (4)
Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative

analysis by classical and modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Prerequisite: Chem 12. Laboratory fee, $35. (Fall and Spring)

151–52 **Organic Chemistry** (3–3)
Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 **Organic Chemistry Laboratory** (1–1)
Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

English

*9 **English Composition: Language as Communication** (3)
Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs, also includes content covered in Engl 10. Class meets five hours per week. Special fee, $25. (Fall and Spring)

*10 **English Composition: Language as Communication** (3)
Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and Spring)

Geology

136 **Engineering Geology** (3)
For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31; Phys 2 or 4; or permission of instructor. Laboratory fee, $14. (Spring)

Mathematics

31 **Single-Variable Calculus I** (3)
Differentiation and integration of algebraic functions, exponentials, and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and Spring)

32 **Single-Variable Calculus II** (3)
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; three-dimensional vectors. Prerequisite: Math 31. (Fall and Spring)

33 **Multivariable Calculus** (3)
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and Spring)

113 **Graph Theory** (3)
Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions, Eulerian and Hamiltonian graphs, planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 **Introduction to Abstract Algebra** (3–3)
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

* Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10

124 **Introduction to Matrix Theory** (3)
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42 or permission of instructor. (Fall and Spring)

139 **Advanced Calculus I** (3)
Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 **Advanced Calculus II** (3)
Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

153 **Introduction to Numerical Analysis I** (3)
Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices. Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)

154 **Introduction to Numerical Analysis II** (3)
Numerical differentiation and integration. Solution of ordinary differential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite: Math 153 or permission of instructor. (Spring, odd years)

157 **Introduction to Complex Variable Theory** (3)
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

Physics

13 **General Physics for Engineering and Applied Science** (3)
Development of basic principles of classical mechanics including statics and dynamics of rigid bodies and simple fluids, wave motion, geometrical and physical optics. Prerequisite: two years of college preparatory mathematics.

14 **Mechanics and Thermal Physics** (3)
Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Vector calculus, equilibrium phenomena, kinematics, Newton's laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $20.

15 **Electricity and Magnetism** (3)
Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Static electric fields. Coulomb law, Gauss law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere law, Faraday law, Maxwell equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $20.

16 **Modern Physics** (3)
Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Wave-particle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spectra, atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

Statistics

118 Regression Analysis (3)
Lecture (3 hours), laboratory (1 hour). Regression and correlation theory; simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91. Laboratory fee, $20. (Fall and Spring)

119 Analysis of Variance (3)
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $20. (Spring)

159 Principles of Bayesian Statistics (3)
Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: 3 semester hours in introductory statistics, or equivalent.

187 Introduction to Sampling (3)
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 Nonparametric Statistical Inference (3)
Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)



General Information

Registration

The dates, hours, and place of registration are stated in the *Schedule of Classes*, which is available well in advance of each semester.

New and readmitted students cannot register for classes without having received a letter of admission to the University issued by the appropriate admitting office.

No registration is accepted for less than a semester or less than one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned prior to registration. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the University who was not registered for campus courses during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before the student is eligible for registration.

Continuing Student—The student registered for campus courses or having continuous enrollment or leave of absence status in the immediately preceding semester or the summer session preceding the fall semester is eligible to register, assuming good standing and enrollment in a continuing program.

Graduate Registration

Registration in master's thesis courses (299–300) entitles the student, during the period of registration, to the advice of the member of the faculty under whom the thesis is to be written. In the event a thesis is unfinished, an additional semester will be granted. If preparation of the thesis extends

beyond the three-semester period, approval for another extension will be required; the student must repeat thesis course 300 and pay tuition as for a repeated course, provided the overall time limit for earning the degree will not be exceeded.

Full-time doctoral students must register for a minimum of 12 semester hours per semester until 24 hours of work have been completed beyond the qualifying examination and for a minimum of 4 semester hours per semester thereafter until satisfactory completion of the final examination.

Part-time doctoral students must register for a minimum of 6 semester hours per semester until 24 hours of work have been completed beyond the qualifying examination and for a minimum of 4 semester hours per semester thereafter until satisfactory completion of the final examination.

No minimum hour load is required during the summer sessions.

Completion of Registration

Registration is not complete until financial settlement is made. Attendance in class is not permitted until registration has been completed.

Registration Changes and Withdrawals

See pages 218–19, 227–28.

Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. should consult the program announcements of the other institutions. Consortium application forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. To participate in the Consortium program, students must obtain the approval of an adviser and should ascertain their eligibility to take the course from the department of the institution where the course is taught and whether there is space in the class. Specific inquiries should be addressed to the Registrar.

Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1983 summer sessions and the 1983–84 academic year.

Tuition Fees

Each semester hour, not to exceed $3,350.00 per fall or spring semester	$248.00
Each semester hour, summer sessions	220.00

University Center Fee
(charged all students registered on campus)

Each semester hour, not to exceed $74.00 per semester	7.00

Additional Course Fees

In certain courses additional fees, such as laboratory and materials fees, are charged as indicated in the course description. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Residence Hall Fees

See pages 236–37.

Special Fees and Deposits

Application fee (undergraduate degree candidates), nonrefundable	$20.00
Application fee (graduate degree candidates), nonrefundable	35.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	200.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period:	
During first week of classes	25.00
During second week of classes	50.00
After second week of classes (if permitted)	100.00
Late-payment fee, for failure to make payments when due (see *Payment of Fees* below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see *Payment of Fees* below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Binding fee, for master's thesis	15.00
Fee for microfilm service and printing announcement of final examination for doctoral degree	75.00
Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof except the summer term	5.00
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
Waiver examination to qualify for advanced placement	5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10.00
Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following: (1) the services of the Student and Alumni Career Services Center; (2) the use of the Melvin Gelman Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscrip-

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next regular laboratory period.

tion to the *GW Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8% per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will automatically be charged a $15 late-payment fee and will be subject to the interest charge of 8% per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Returned-Check Policy

A student whose check is returned unpaid by the bank for any reason will be charged a returned-check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same penalties and restrictions as for late payment enumerated above.

One-Year Prepaid Tuition Plan

Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1983–84 rate, students choosing this plan would pay $6,645 for two semesters instead of $6,700.

Four-Year Prepaid Tuition Plan

New undergraduate students may elect to pay in advance the total tuition for their full four-year programs at the rate applicable to their first year. Under this plan, the payment for programs beginning with the 1983 fall semester would be $26,800. Refunds to students who do not complete their full four-year programs would be made at the original rate for all remaining full semesters.

Commercial Prepaid and Deferred Payment Plans

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301
4. School-Chex, Irving Trust Company, P.O. Box 12231, Church Street Station, New York, N.Y. 10249

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs but will be happy to provide guidance to students and parents.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in class schedule are made by completing the George Washington University Change Slip (obtainable in Tompkins Hall, Room 103), securing the approval of the appropriate faculty, and submitting the form to Tompkins Hall, Room 103, for the dean's signature. Notification to an instructor is not an acceptable notice (see Withdrawal, page 227).

Withdrawal and Change in Course Status

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, the department, and the dean. The dean's approval may be obtained in Tompkins Hall, Room 103.

The status of a course may not be changed from credit to audit or vice versa after the 28th day after classes have started for the semester. For other regulations governing withdrawal and changes in program, see pages 227–28.

* Regulations concerning withdrawals and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes*.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. **Complete withdrawal** from the University:
   Withdrawal dated on or before Saturday of the first week of classes 90%
   Withdrawal dated on or before Saturday of the third week of classes...75%
   Withdrawal dated on or before Saturday of the fifth week of classes 50%
   Withdrawal dated after the fifth week of classes .....none
2. **For a change in status from full-time to part-time student** or for **partial withdrawal by a part-time student,** the above schedule applies to the difference between charges for the original program and the adjusted **charges for the revised program.**
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. A student who is granted leave before completing the semester will receive credits for current charges in accordance with the schedule for complete withdrawal from the University (see No. 1, above). Payments made in excess of the nonrefundable balance will be refunded to the student.
5. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

George Washington University offers a program of financial assistance for undergraduate and graduate students. Undergraduate aid consists of two basic types: awards for academic achievement without reference to financial circumstances (honor scholarships) and scholarships, grants, loans, and employment based on demonstrated financial need. Applicants may apply for only **one** type of aid: need-based or honor. The program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. In addition, loans and resident assistantships not based on financial need are available to undergraduates and graduates alike. Information on the various programs is given below.

Scholarships and Other Forms of Aid for Undergraduates

Engineering Honor Scholarships (EHS)—Academic Merit Only

This program was initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of merit only and financial need is not a requirement for consideration. The EHS is available to entering freshmen and to transfer students who have (or will have by the time of entrance to SEAS) compiled 30 semester hours of college-level work that includes 6 semester hours of calculus or higher math and 3 semester hours of either physics or chemistry. The EHS is available to U.S. citizens or students with permanent visas.

These scholarships cover one-half the tuition costs of attending SEAS and will be awarded to qualified students for up to four years as long as scholarship criteria are met, with the option of a fifth year if the student wishes to obtain a master's degree. Applicants with financial need should apply for need-based aid, **not** for EHS.

Applications and supporting credentials for financial aid must be filed by February 1 (entering freshmen) or March 1 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.* ***A student must reapply for the EHS each year.***

Minimum Criteria for Incoming Freshmen

The minimum criteria in the EHS Program are based on merit. The student must have:

1. achieved a minimum combined SAT score of 1250 or better, or if the SATs have not been taken, an average ACT score of 30 or better in the English/mathematics/natural science tests or a combined PSAT score of 125 or better;
2. ranked at the end of the junior year in the upper 10% of the class over a period of three years or more;
3. achieved an average grade of 85% or better at the end of the junior year in mathematics and science courses taken during the previous three years.

Minimum Criteria for Incoming Transfer Students

The minimum criteria in the EHS Program are based on merit. The student must have:

1. completed (or will have completed at the end of the present semester) 30 semester hours in an accredited community college, college, or university;
2. completed courses that must include at least 6 semester hours of college calculus or higher mathematics and at least 3 additional hours of college-level physics or chemistry;

* Summer sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester

3. achieved an overall quality-point index of at least 85% (3.4) and a combined average of 80% (3.2) in college-level mathematics and science courses.

Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based on demonstrated need. The University participates in the National Direct Student Loan, Pell Grant (formerly Basic Educational Opportunity Grant), Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by February 1 (entering freshmen) or March 1 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.* ***A student must reapply for financial aid each year.***

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry at least 15 semester hours per semester in subjects related to the degree program during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science. The University also offers other scholarships that are open to engineering students.

Frederick Albert and Alma Hand Britten Scholarships (1959)—Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Available for undergraduate and graduate study.

American Association of Cost Engineers Scholarship (1977)—Established by the American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum that includes courses related to cost engineering.

Atlantic Research Corporation Scholarship (1979)—Established by the Atlantic Research Corporation for both graduate and undergraduate students. The scholarship for undergraduates includes full tuition, books, and fees for students in their senior year only. Graduate students receive full tuition, books, and fees for one year of full-time graduate work. Recipients of the award must have an overall *B* average and must agree to accept employment with Atlantic Research Corporation for one year after graduation. Awards are offered on both a financial-need and a non-financial-need basis. See Manager of Engineering Admissions for further details.

Henry Harding Carter Scholarship (1896)—Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing

* Summer sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester

for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

Henry Parsons Erwin Scholarship (1955)—Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in Engineering and Applied Science.

The George Hyman Construction Company Scholarships (1974)—Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial tuition undergraduate scholarships begin in the fall semester and may be renewed for four years, provided the holder reapplies by the published deadlines, maintains a *B* average based on a full course load leading to a degree in civil engineering, and continues to be in financial need.

George Washington University Board of Trustees Scholarships—Full and partial tuition undergraduate scholarships that begin in the fall semester and may be renewed for four successive academic years, provided the holder reapplies by the published deadlines, maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree.

Louis E. Giles Memorial Scholarships (1966)—Bequest of Susie E. Giles in honor and memory of her husband for scholarships to undergraduate and graduate students in the School of Engineering and Applied Science who need financial assistance.

National Fund for Minority Engineering Students Scholarship (1977)—Scholarship for minority students who require financial assistance of up to $2,500 and are in good academic standing. Minority students are defined as full time students of black, Puerto Rican, American Indian, or Chicano descent who are U.S. citizens or permanent residents and are entering an engineering school or university for the first time. (A non-need-based award of $500 may also be made to qualified minority students.)

Scholarships, Fellowships, Assistantships, and Other Forms of Aid for Graduate Students

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted not later than February 1 preceding the academic year for which the award is made. Application for admission to graduate study is a prerequisite for consideration.

Graduate Scholarships and Fellowships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship—Scholarship for outstanding students in the fields of science, engineering, and medicine.

Frederick Albert and Alma Hand Britten Scholarships (1959)—See p. 221.

American Association of Cost Engineers Scholarship (1977)—See p. 221.

Louis E. Giles Memorial Scholarships (1966)—See above.

Graduate Engineering Honors Fellowship (GEHF) Program—Established to recognize and reward students who have achieved academic excellence and are interested in starting or furthering graduate work. Students selected for the GEHF Program will receive the following: (1) a half-tuition scholarship for the first year of graduate study; (2) renewal of the half-tuition

scholarship for (a) one additional year for master's and professional degree students or (b) two additional years for doctoral students provided that a minimum 3.4 cumulative grade-point average is maintained while a full-time (nine semester hours per semester) student. It should be noted that one grade of *F*, regardless of cumulative grade-point average, disqualifies the recipient from further scholarship assistance. Students must satisfy the following criteria to qualify for consideration in the GEHF Program: (1) be a U.S. citizen or a permanent resident of the U.S.; (2) fully meet current School of Engineering and Applied Science requirements for admission to the appropriate program; (3) have attained approximately a 3.5 grade-point average in the prior degree from an accredited college or university; consideration is given to the content of programs completed and the academic reputation of all previous post-secondary institutions at which study was undertaken; (4) provide three letters of recommendation from professors in the previous academic program. Selection is made by the Dean of the School of Engineering and Applied Science. A limited number of these Fellowships are available each year. Students in the GEHF Program must carry an academic workload of at least nine graduate semester hours per semester in the degree program in which they have been accepted. At least three months prior to the semester they wish to begin study, students should submit applications, transcripts, and letters of recommendation to the Manager of Engineering Admissions, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

National Science Foundation Graduate Fellowships—Fellowships providing tuition, fees, and stipends to students in programs leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences and in the history and philosophy of science. Open to students who have been admitted to graduate status and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Phi Delta Gamma Scholarship Endowment Fund (1968)—Established by the Beta Chapter of Phi Delta Gamma (national fraternity for graduate women) for women graduate students.

Assistantships

Research Assistantships in Engineering Administration—Available to graduate students in any Engineering Administration program. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program. Stipends range up to $8,500 depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from the Chairman, Department of Engineering Administration.

Research Scholar Assistantships, GWU/NASA–Langley Program—See page 43.

Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others that may be used in support of graduate study is available at the Graduate Fellowship Information Center,

2130 H St., N.W., Room 621D, for students enrolled at George Washington University. Information is also available on such distinguished programs as the Rhodes, Marshall, National Science Foundation, Fulbright, Luce, and Rotary International, as well as many others.

Since deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

Forms of Aid Available to Undergraduate and Graduate Students

Assistantships

Research Assistantships in Operations Research and Related Fields—Available to graduates and to undergraduates on the junior and senior levels in any school of the University. Research assistants are expected to work 20 hours a week conducting research in support of an established research program, in programming, or in conducting individual research on an approved research project. Stipends range up to $10,000, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part-time, and staff members are required to enroll as full-time students in degree-granting programs. Further information may be obtained from the Office of the Director of Housing and Residence Life.

Loan Funds

The following loan funds are available to undergraduate and graduate students. A separate application must be submitted for all loan programs. Applications for the National Direct Student Loan should be filed no later than February 1 (entering freshmen), March 1 (enrolled undergraduates or entering transfer students), or April 1 (graduate students). Complete information is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
University Student Emergency Loan Fund

John Brewster Willis, Jr., Loan Fund in Mechanical Engineering—Established by Mrs. William L. Lane as a memorial to her nephew, John Brewster Willis, Jr. Available to Mechanical Engineering students (graduate or undergraduate) who are primarily interested in aeronautics.

Guaranteed Student Loan Program—George Washington University is an eligible participant in the Federally Insured State Guaranteed Student Loan Program. Undergraduate students may apply for a maximum of $2,500

per year. Graduate students may apply for a maximum of $5,000 per year. Students who intend to use the loan for payment of tuition at registration should submit an application and all required supporting documents no later than June 1.

Parents Loan for Undergraduate Students/Graduate Students—George Washington University is also an eligible participant in the Parents Loan for Undergraduate Students Program (PLUS), sometimes referred to as the Auxiliary Loan to Assist Students. The interest rate on the loan may be either 12% or 14%, depending on the fluctuation of the interest rate on U.S. Treasury Bills. Repayment begins 60 days after the disbursement of the check. Parents of dependent undergraduate students may apply for up to $3,000 per year. Independent undergraduate students may apply for up to $2,500 per year under the PLUS and GSL programs combined. Graduate students may apply for up to $3,000 per year. Students who intend to use the loan for payment of tuition at registration should submit an application no later than June 1.

Student Employment

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Student and Alumni Career Services Center maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration students may apply at the Student and Alumni Career Services Center, Academic Center, 801 22nd Street, N.W., Suite T509, for interviews and referrals to positions for which they are qualified.

International Students

Undergraduate international students with proven financial need, but with no prior schooling in the United States, who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships. If before coming to this University, they have completed at least one year in a U.S. high school and have taken SAT tests, they may apply for financial assistance upon admittance. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, pages 219–21.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English, both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are generally available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September–May) is at a minimum approximately $11,400. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included. This amount also does not cover tuition or living expenses for the summer.

Prizes

Norman B. Ames Memorial Award—Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by fellow students as having made significant contributions to the students in the School of Engineering and Applied Science, to the School, and to the University.

Deacon Ames Activities Award—A plaque awarded annually by Gamma Beta Chapter of Theta Tau Fraternity to the senior in the School of Engineering and Applied Science with the most outstanding record in activities for the entire period of attendance.

Martin Mahler Prize in Materials Testing—A one-year membership in the American Society for Testing Materials awarded to the upper-division or graduate student in engineering who submits the best reports on tests in the materials laboratory course with preference given to prestressed concrete tests.

Alfred Martin Freudenthal Prize—Established as a memorial to Professor Freudenthal by his wife, friends, students, and colleagues for his outstanding contributions to engineering education and awarded annually to the senior who graduates with the highest scholastic standing. The student receives a cash award, and his or her name is engraved on a plaque displayed in Tompkins Hall.

Regulations

A student enrolled in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws, is suspended, or for any other reason is not registered at the University for one semester or more may re-enter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible for subsequent registration in the University except by special action of the Faculty.

Academic Dishonesty

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with and make use of all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and will be held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered

academic dishonesty. Acts of academic dishonesty are legal, moral, and intellectual offenses against the community and will be prosecuted through the proper University channels.

Copies of the University Policy on Academic Dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

Student Conduct

All students, upon enrolling and while attending the George Washington University, are subject to the provisions of the *Statement of Student Rights and Responsibilities*, which outlines student freedoms and responsibilities of conduct, the Judicial System for Nonacademic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained from the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

Changes in Program of Study

A student may not make any changes in an approved program of study without the approval of the faculty adviser instructor, international student adviser (when appropriate), and the Associate Dean. Requests for changes in class registration must be made on a form provided in the School's Admissions office.

Adding Courses

During the 14 days following the first day of classes of a semester, courses may be added to the student's program with the approval of the instructor, the faculty adviser, and the Associate Dean.

Dropping Courses

Regular Drop—Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, the department, and the Associate Dean.

Late Drop—Permission to drop any course without academic penalty after the 28th day following the first day of classes of a semester may be granted with the approval of the instructor, the student's adviser, the chairman of the department in which the student is enrolled, and the Associate Dean. Requests for late drops must be submitted to the Associate Dean's office on the appropriate late-drop form and must be accompanied by a change slip and certification of sickness or injury, if such is the cause of the late withdrawal. Late drops may be granted only under both of the following conditions:

1. It is necessary because of exceptional circumstances such as certified medical absence or forced absence caused by work-related requirements.

2. The grades in all courses involved are *C* or better for graduate students and *D* or better for undergraduate students as of the date of the request.

In all cases, financial regulations governing withdrawal remain in full effect.

Change in Course Status—The status of a course may not be changed from credit to audit or vice versa after the 28th day after classes have started for the semester.

Full tuition is charged for courses dropped without the approval of the Associate Dean. Such unauthorized withdrawal will result in the recording of a failing grade for the course or courses. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

Withdrawal

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

Applications for withdrawal from the University or for changes in class scheduling must be made in person or in writing to the individuals indicated below. Notification to an instructor is not acceptable notice.

Credit

Credit is given only after registration for a course and satisfactory completion of the required work or upon the granting of advanced standing.

Auditing—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Balance Sheet—On request the School's Admissions Office will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Postadmission Transfer Credit—A student who plans to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the department chairman, and the Associate Dean on a form available in Tompkins Hall, Room 103. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

Transcripts of Record

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

Graduation Requirements

To be recommended by the faculty for graduation, a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which he or she is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) dated September 30, provided they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Student Records—Information on the status of credit, transfer-of-credit awards, balance sheets, and other information relating to graduation may be obtained in Tompkins Hall, Room 103.

Area of Concentration Certificate—Upon successful completion of the master's degree the student, by means of a written request to the appropriate department chairman, may obtain a certificate indicating the area of concentration.

The Library

All students registered in the University have the privilege of using the Melvin Gelman Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book that circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open; they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the Gelman Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;

3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: **name, local address, and telephone number; name and address of next** of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Property Responsibility

The University is not responsible for the loss of personal property. A Lost and Found Office is located on campus in the Safety and Security Office.

University Policy on Drugs

The University cannot condone violations of law, including violations of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

Consortium of Universities of the Washington Metropolitan Area, Inc.

The universities in Washington, D.C. (American University, Catholic University of America, George Washington University, Georgetown University, Howard University, and the University of the District of Columbia) are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all of the members the particular courses that best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in Canon Law, Dentistry, Medicine, and Theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all participating institutions. See page 215 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in Tompkins Hall, Room 103. Students register and pay tuition at their own institutions for Consortium courses; course fees are payable to the visited institutions.

Center for Academic and Administrative Computing

The Center for Academic and Administrative Computing (CAAC) is located in the Academic Center, 801 22nd St., N.W. CAAC facilities are normally available 24 hours a day during the academic year, to all faculty, staff, and students.

CAAC encourages interest in computers by providing computing facilities and by offering short courses and technical assistance. Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request and without charge.

CAAC maintains two IBM 4341s (VM/SP and OS/VS1). A full range of compilers and application software packages is available including (but not limited to) CMS, XEDIT, FORTRAN, COBOL, PL/1, PASCAL, APL, SPSS, SAS, BMDP, ASSEMBLER, ASSIST, and SCRIPT. In addition, CAAC provides an easy-to-learn, terminal-based, text-editing system on a PDP 11-70 computer.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that use the computer as a research adjunct to course work.

Speech and Hearing Center

The Speech and Hearing Center offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

Reading Center

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school students, college students, and other adults.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

Fees—Individuals should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center, Building C, Suite 429, 2201 G Street, N.W.

Veterans Benefits

The Veterans Benefits Office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists those students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor that sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is at 941 North Capitol St., N.E., Washington, D.C. 20421.

ROTC

George Washington University students may enroll in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

For information on the George Washington University Naval Reserve Officers Training Corps Program, see pages 47–48.

Alumni Associations

General Alumni Association

The objectives of this Association are to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Membership in the Association is conveyed automatically to anyone who has been graduated from any school or division of the University. Anyone who has earned 15 semester hours or the equivalent at the University and whose class has been graduated is eligible for membership. For Division of Continuing Education and Summer Sessions students, however, only the "15 semester hours earned" requirement, not the "graduation of the class" requirement applies. Any persons who are or have been members of the University's Board of Trustees, faculty, or administrative staff, as well as anyone else determined to qualify by the Governing Board, are eligible for membership in the Association.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

All alumni are urged to keep the Alumni Relations Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

Engineer Alumni Association of the George Washington University, Inc.

The Association was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to engineering alumni. The objectives of the Association are to provide the link between the graduates and faculty of the School, to help promote the general

welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 elected members of the Association and the Engineers' representatives serving on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the student body. Members of the Association are elected each year, prior to the June meeting, to three-year board memberships as listed below:

Term Expiring 1983
Robert Dickey, Jr.
Jacquelyn Eisenberg
Pastor Farinas
David W. Johnson
Harold Sangster

Term Expiring 1984
Frank F. Atwood
Nahid Khozeimeh
Eric S. Mendelsohn
Dudley J. Schwartz
James A. Sinsabaugh

Term Expiring 1985
Wesley G. Harris
Richard Hu
Michael Hubbard
Mary O. Jones
Malcolm O'Hagan

General Alumni Association Representatives
John R. Manning
Issa Khozeimeh
Malcolm O'Hagan

Student Representative
Annette Eichorn

Faculty Representative
Galip M. Arkilic

Regional Director
William H. Holt

At the June meeting each year, 1982–83, the board elects officers for its operation during the upcoming year. The officers for the year are:

President: Eric S. Mendelsohn, B.S.(C.E.) 1967; 7728 Warbler Lane, Derwood, Maryland 20855
Vice President: Dudley J. Schwartz, M.S. 1973; 14132 Flint Rock Road, Rockville, Maryland 20853
Secretary: Mary O. Jones, M.S. 1976; 1818 North Cleveland Street, Arlington, Virginia 22201
Treasurer: Richard Hu, M.E.A. 1973; 2326 North Tuckahoe Street, Arlington, Virginia 22205

Student Life

The Office of the Vice President for Student and Alumni Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Services, Student Activities, Student and Alumni Career Services, and Student Health Service.

Student Services

Office of the Dean of Students

The Office of the Dean of Students provides counseling and information for students and assists in program development for the Division of Student Affairs. Staff members are well informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students is responsible for the services and programs offered by the Counseling Center, the Educational Opportunity Program, International Services, Services for Students with Disabilities, the Student Health Service, and the Student and Alumni Career Services Center.

Services for Students with Disabilities

The Director of Services for Students with Disabilities works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extracurricular life of the campus are provided for them through University or community resources.

Housing and Residence Life

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University may also be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive with his or her notification of acceptance University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a $200 ***nonrefundable deposit***. The housing deposit is either credited toward the first semester's room charge or held as a security deposit on an apartment. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester.

1983-84 Residence Hall Rates per Person for Two Semesters*

For Men:

Calhoun Hall	
double room	$2,060
triple room	2,000

For Women:

Strong Hall	
single room	2,230
double room	2,060
triple room	2,000

For Men and Women:

Crawford Hall	
double room	2,060
Everglades Hall† (limited to juniors and seniors)	
apartment for two persons	2,280 or 2,170
Building JJ (limited to sophomores, juniors, and seniors)	
apartment for four to six persons	2,140
Francis Scott Key Hall (limited to juniors and seniors)	
apartment for one person	2,380
apartment for two persons	2,270
apartment for three persons	2,270 or 2,140
Madison Hall	
double room	2,060
triple room	2,000
Milton Hall† (limited to juniors and seniors)	
apartment for two persons	2,290 or 2,190
apartment for three persons	2,080
Mitchell Hall	
single room	2,230
Munson Hall† (limited to juniors and seniors)	
apartment for two persons	2,290 or 2,190
apartment for three persons	2,080

* Residence Hall prices and allocation subject to change

† Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate

Thurston Hall

double room, triple room, room for four	2,060
suite for six	1,930

Guthridge Apartments

This apartment house is a University owned, commercially operated building within the campus area. It contains efficiency and one-bedroom units that are rented only to full-time graduate students on an "as available" basis. Referrals to the resident manager of this building are made by the Director of Housing and Residence Life when notice is received of vacancies. Leases are executed with the management company and are on a month-to-month basis.

Food Service

Resident freshmen and sophomores are required to choose one of the following three food service plans. The seven-day, 19 meals per week plan at $1,700* for the academic year, the any 14 meals per week plan at $1,630* for the academic year, or the any 10 meals per week plan at $1,570* for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and George's.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Educational Opportunity Program

The Educational Opportunity Program is designed to provide selected District of Columbia high school graduates and other qualified District residents with financial and personal support as well as academic assistance while they pursue undergraduate degree work at George Washington University. The Program office is located at 2127 G Street, N.W.

Cloyd Heck Marvin Center

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, by the departments of drama, dance, and music, and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the Center by working closely with the full-time staff in the development of procedures and policies that provide a framework for the Center's operation.

* Food service prices subject to change.

Student Health Service

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician's assistants who are capable of addressing most of the students' medical problems. Visits are cost-free and may either be arranged by appointment or, during certain hours, be secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost. Many common medications are stocked to fill students' prescriptions. Allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in the off-campus programs and the Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should consult the Student Health Service or the Office of the Dean of Students.

Counseling Center

The Counseling Center, located at 718 21st St., N.W., works to enable students to overcome obstacles that hamper learning. The Center's services are offered to students and staff and include resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills training; training of graduate students, resident assistants, and paraprofessionals; consulting on mental health topics; and development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing, and special assessments for business and industry. Through its Office of Community Services, the Counseling Center also provides vocational counseling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and from 1 to 4:30 p.m., Fridays. If the student decides to continue, a modest fee per appointment will be charged for short-term treatment. If a test battery is called for, an additional materials fee will be charged. If financial need is a factor, however, fee adjustments can be made.

International Services

Located in the International House at 2129 G St., N.W., the staff of International Services provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

Student and Alumni Career Services Center

The Career Services Center provides career guidance and placement assistance to University students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a resource center of literature on occupations and employers, and current information on government employment including testing dates and application forms. Seniors and alumni may also use the Center to establish credential files for application to graduate schools and for employment. The Center is located in the Academic Center, 801 22nd Street, N.W.

Religious Life

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

Davis-Hodgkins House

The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The House, at 2142 G Street, N.W., provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

Student Activities

The offices of the Vice President for Student and Alumni Affairs, the Dean of Students, the Director of the Cloyd Heck Marvin Center, and the Director of Student Activities are responsible for all cocurricular phases of student life.

Student Activities Office

The Student Activities Office assists individual students and organizations in program development, campus leadership training, and participation in special projects, both within the University community and the community at large. The Office serves as a clearinghouse for activity information, registers and advises student organizations, and informs the University community of activities and programs through monthly and annual publications. The Student Activities Office is also responsible for coordinating the orientation program for new students and for planning supplemental development pro-

grams for graduate and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

Additional information about the numerous student organizations and committees is contained in the *Student Handbook*, compiled by and available from the Student Activities Office in the Marvin Center.

Student Government

The George Washington University Student Association is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The Student Association provides various services for students such as an academic evaluation, a student directory, and the Student Advocate Service. Further information can be obtained from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped in developing policies and programs beneficial to students and the total University community.

The Engineers' Council

The Engineers' Council is the student governing body for the School of Engineering and Applied Science, composed of elected representatives from each class, and the graduate student body, and each student organization in the School and the House Manager of the Davis-Hodgkins House. The purpose of the Council is to provide liaison between the student body of the School and the Faculty, Administration, and Student Government of the University in all matters affecting the general interests and welfare of the student body, the School, or the University. The Council is maintained financially by the Engineers' Council fee paid by each student in the School and sponsors the Engineers' Mixers and the Engineers' Ball. Council meetings are open to all students in the School.

Student Organizations

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 160 organizations on campus concerning a broad spectrum of interests: academic, professional, honorary, international, cultural, political interest, service, special interest, sports, hobbies and recreation, religious and meditative, and social fraternities and sororities. More complete information about these organizations can be obtained through the Student Activities Office.

The following are of particular interest to students in the School of Engineering and Applied Science.

Honor Societies

Delta Sigma Rho-Tau Kappa Alpha—A national forensic society.

Eta Kappa Nu (Theta Iota Chapter)—A national electrical engineering honor society established to recognize scholarship, character, and service.

Mortar Board—A national society for juniors and seniors, stressing leadership, scholarship, and service.

Omega Rho—A national operations research honor society established to recognize outstanding scholarship, character, and service.

Omicron Delta Kappa—A national society emphasizing leadership in extracurricular activities.

Phi Eta Sigma—A national society established to encourage and reward high scholarship and attainment; limited to those freshmen who attain a scholastic average of at least 3.50 or the equivalent.

Pi Tau Sigma—A national honorary mechanical engineering fraternity. Candidates are selected from the junior and senior classes on the basis of sound engineering ability, scholarship, and personality.

Sigma Xi—A national scientific honor society whose purpose is to encourage original investigation in pure and applied science. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

Tau Beta Pi—A national engineering honorary fraternity whose purpose is to recognize distinguished scholarship and exemplary character.

Professional Organizations

American Society of Civil Engineers (Student Chapter)
American Society of Mechanical Engineers (Student Chapter)
Institute of Electrical and Electronic Engineers (Student Chapter)

Theta Tau (Gamma Beta Chapter)—A national professional (engineering) fraternity. Membership is by invitation to outstanding students who have successfully completed at least the first year in the School of Engineering and Applied Science.

Athletics, Intramural Sports, and Recreation

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight rooms; handball and squash courts; a sauna; and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association for Intercollegiate Athletics for Women, and the Eastern Association of Intercollegiate Athletics for Women. Its varsity teams compete against major universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

Major Program Events

Art Exhibits—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the Curator of Art, an annual student art exhibit is presented.

Concert Series—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board—The University Program Board, composed chiefly of elected and appointed students, is given primary responsibility and resources for student programming on campus. Through its various committees and in cooperation with other campus groups, it regularly sponsors films, lectures, concerts, social activities, and special events.

Theater—The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.



The University

History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is large but intangible.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice and the theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The

Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area is not without its reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street; the first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets; and Washington had selected Twenty-third and E Streets as the site of the national university he hoped to see established.

The University as it is now organized consists of the Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; the Division of Continuing Education and Summer Sessions; and the Division of Experimental Programs.

The George Washington University is privately endowed. It is governed by a Board of Trustees of which the University President is an *ex officio* member.

University Libraries

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the Institute for Sino-Soviet Studies, the National Law Center, and the School of Medicine and Health Sciences.

These collections contain approximately 1,270,000 volumes, to which are added some 50,000 volumes a year. Endowments supplementing the University appropriation provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences; and gifts from many sources have enriched the collections. The libraries currently receive about 14,000 serials.

Information concerning the use of the libraries may be obtained at the library service desks.

The Gelman Library is administered for the curricular, research, and recreational needs and interests of the students. Instruction in the use of the library is given upon request by the reference librarians. The library endeavors to assist students and all members of the University in using the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city and throughout the United States.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card, which permits direct borrowing from the libraries of the other Consortium Institutions.

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Joseph Foa, *Professor Emeritus of Engineering and Applied Science*
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Kenneth Johnson, *Professor Emeritus of Engineering Administration*
B.A. 1931, Indiana State University; Ph.D. 1937, Purdue University

Herbert Ernest Smith, *Professor Emeritus of Engineering Administration*
B.S. 1930, C.E. 1932, City University of New York, City College; M.S. 1936, Ph.D. 1940, New York University

Carl Hugo Walther, *Professor Emeritus of Engineering and Applied Science*
B.E. 1931, M.C.E. 1933, Johns Hopkins University; Ph.D. 1967, University of Maryland

Active

Abd Elfattah Abd Alla, *Professor of Engineering and Applied Science*
B.S. 1960, Ain Shams University, Egypt; M.S. 1963, Alexandria University, Egypt; Ph.D. 1969, University of Maryland

Julian Gordon Adler, *Associate Professorial Lecturer in Engineering*
B.S.E. 1960, University of Michigan

Joseph Morris Aein, *Professorial Lecturer in Engineering*
B.S. in E.E. 1958, Massachusetts Institute of Technology; M.S. in E.E. 1958, Ph.D. 1962, Purdue University

Charles Alexander, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1962, Lowell Technological Institute; M.S. 1965, University of New Hampshire; Ph.D. 1973, University of Maryland

Charles Anello, *Professorial Lecturer in Engineering*
B.S. 1958, Towson State University; Sc.M. 1962, Sc.D. 1964, Johns Hopkins University

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B.E.E. 1956, M.E.E. 1963, Polytechnic Institute of New York; Ph.D. 1975, New York University

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B.S. in E.E. 1932, City University of New York, City College; M.E.A. 1960, George Washington University; Ph.D. 1963, American University

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* Professors, Adjunct Professors, Associate Professors, Assistant Professors, and Instructors constitute the Faculty. The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty.

Galip Mehmet Arkilic, *Professor of Applied Science*
B.S. in M.E. 1946, Cornell University; M.S. 1947, Illinois Institute of Technology; Ph.D. 1954, Northwestern University

Ernest S. Armstrong, *Assistant Professorial Lecturer in Engineering and Applied Science*
B.S. 1959, M.S. 1961, Clemson University; Ph.D. 1967, North Carolina State University at Raleigh

Clifford J. Astill, *Professorial Lecturer in Engineering*
B.E. 1958, University of Queensland; M.S. 1968, D.Sc. 1971, Columbia University

Harold Sidney Balaban, *Associate Professorial Lecturer in Engineering*
B.B.A. 1955, City University of New York, City College; M.A. 1962, American University; Ph.D. 1978, George Washington University

Gordon Banerian, *Professorial Lecturer in Engineering*
B.S. (M.E.) 1943, Lawrence Institute of Technology; M.S. 1950, Wayne State University; Ph.D. 1969, University of California, Davis

Richard Walker Barnwell, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Auburn University; Ph.D. 1968, Virginia Polytechnic Institute and State University

Nicholas L. Basdekas, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, C.E. 1958, Columbia University; Ph.D. 1969, Catholic University of America

Harry Lee Beach, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1966, M.S. 1968, Ph.D. 1970, North Carolina State University at Raleigh

John Amos Belding, Jr., *Professorial Lecturer in Engineering*
B.S. 1965, Ph.D. 1969, University of Alabama

Bruce A. Bell, *Professor of Engineering*
B.C.E. 1968, M.S.C.E. 1969, Ph.D. 1974, New York University

John William Benoit, *Associate Professorial Lecturer in Engineering*
B.S. 1952, University of Washington; M.S. 1954, North Carolina State University at Raleigh; Ph.D. 1961, Princeton University

Simon Ya Berkovich, *Associate Professor of Engineering and Applied Science*
M.S. 1960, Moscow Physical Technical Institute, U.S.S.R.; Ph.D. 1964, Institute of Precise Mechanics and Computer Technology, U.S.S.R.

John Albert Berning, Jr., *Associate Professorial Lecturer in Engineering*
B.A. 1972, Colgate University; M.A. 1974, Ph.D. 1978, Duke University

Alan McCauley Biddison, *Assistant Professorial Lecturer in Engineering*
B.S. in Eng. 1962, U.S. Military Academy; M.B.A. 1972, Rochester Institute of Technology; J.D. 1977, George Washington University

William Thomas Bisignani, *Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Ph.D. 1972, Rutgers—The State University

Lewis Horrigan Blakey, *Professorial Lecturer in Engineering*
B.S. in C.E. 1954, University of Notre Dame; M.S. 1962, George Washington University; Ph.D. 1971, Catholic University of America; M.B.A. 1974, University of Chicago

Richard R. Blanchard, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1964, M.S. in E.E. 1966, University of Vermont; M.E.A. 1972, George Washington University

Jerry Wayne Blankenship, *Professorial Lecturer in Engineering*
M.S. 1970, Western Kentucky University; Ph.D. 1974, Northwestern University

Peter S. Bock, *Associate Professor of Engineering*
B.A. 1962, Ripon College; M.S. 1964, Purdue University

William James Boettinger, *Associate Professorial Lecturer in Engineering*
B.E.S. 1968, Ph.D. 1972, Johns Hopkins University

Pock Boon, *Associate Professorial Lecturer in Engineering*
B.S. (E.E.) 1967, University of North Dakota; M.S. (E.E.) 1972, Louisiana State University

Thomas M. Bottegal, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1972, George Washington University

Roland Lee Bowles, *Associate Professorial Lecturer in Engineering*
B.S. 1959, Randolph-Macon College; M.S. 1961, Ph.D. 1971, University of Virginia

Edward Howard Braun, *Associate Professor of Engineering and Applied Science*
A.B. 1948, M.A. 1950, Columbia University

Jacob I. Bregman, *Professorial Lecturer in Engineering*
B.S. 1943, Providence College; M.S. 1948, Ph.D. 1951, Polytechnic Institute of New York

Alan L. Breitler, *Assistant Professorial Lecturer in Engineering*
B.A. 1960, Florida State University; M.A. in Ed. 1966, George Washington University; Ph.D. 1975, Catholic University of America

Fred Michael Brosi, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1970, Carnegie-Mellon University; M.S. 1975, George Washington University

Ronald Max Brown, *Associate Professorial Lecturer in Engineering*
B.S. 1958, M.S. 1960, M.A. 1964, Ph.D. 1970, Indiana University

Stanley Buckser, *Professorial Lecturer in Engineering*
B.S. 1951, Long Island University; Ph.D. 1957, University of Massachusetts; M.S. 1974, Vanderbilt University

William Dickinson Burrows, *Associate Professorial Lecturer in Engineering*
B.A. 1953, Cornell University; Ph.D. 1956, Stanford University; M.S. 1973, Vanderbilt University

Ali Bulent Cambel, *Professor of Engineering and Applied Science*
B.S. 1942, Robert College, Turkey; M.S. 1946, California Institute of Technology; Ph.D. 1950, University of Iowa

John Paul Campbell, *Research Professor of Engineering*
B.S. 1939, Auburn University

Robert L. Carroll, Jr., *Associate Professor of Engineering and Applied Science*
B.S. 1967, North Carolina State University at Raleigh; M.Phil. 1970, Yale University; Ph.D. 1973, University of Connecticut

Herbert Carus, *Associate Professorial Lecturer in Engineering*
B.S. 1943, City University of New York, City College; M.S. 1964, New York University

Shih-Chun Chang, *Assistant Professor of Engineering and Applied Science*
B.S.(E.E.) 1970, National Cheng Kung University, Taiwan; Ph.D. 1977, University of Hawaii

Yun Chang, *Assistant Professorial Lecturer in Engineering*
B.S.(E.E.) 1947, National Tung-Chi University, China; M.S.(E.E.) 1952, Polytechnic Institute of New York

P. Gail Chesler, *Lecturer in Engineering*
B.S. 1965, Pennsylvania State University; M.Ed. 1974, University of Maryland; M.S. 1981, George Washington University

Augustine Yim-Pan Cheung, *Visiting Associate Professor of Engineering and Applied Science*
B.S. 1969, M.S. 1971, Ph.D. 1973, University of Maryland

Chin-Kuei Cho, *Associate Professorial Lecturer in Engineering*
B.S. 1962, National Cheng Kung University, Taiwan; M.S. 1968, University of Houston; Ph.D. 1971, University of Texas

Malcolm P. Clark, *Assistant Professorial Lecturer in Engineering*
B.S. in Ed. 1963, Murray State University; M.S. 1968, George Washington University

Rolf Hans Clark, *Research Professor of Operations Research*
B.S. 1959, Yale University; M.S. 1966, Naval Postgraduate School; Ph.D. 1976, University of Massachusetts

David William Coder, *Associate Professorial Lecturer in Engineering*
B.S. 1957, Ph.D. 1973, University of Maryland

Paul LeRoy Coe, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1966, Hofstra University; M.S. 1967, Ph.D. 1972, New York University

James Thomas Coleman, *Professorial Lecturer in Engineering*
B.S. 1949, B.S. 1951, John Brown University; M.S. in E.E. 1954, University of Arkansas; Ph.D. 1967, Temple University

Terry Leo Collins, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1967, Massachusetts Institute of Technology; M.S. in E.E. 1969, University of Wisconsin; D.Sc. 1976, George Washington University

James Cameron Coolbaugh, *Associate Professorial Lecturer in Engineering*
B.S. 1965, California State University at Long Beach; Ph.D. 1974, Baylor College of Medicine

Paul Arthur Crafton, *Professor of Engineering Administration*
B.M.E. 1944, City University of New York, City College; M.S. 1950, Ph.D. 1956, University of Maryland

Paul James Crepeau, *Professorial Lecturer in Engineering*
B.S. 1957, University of Rhode Island; M.S. 1960, Ph.D. 1967, Polytechnic Institute of New York

Milton Orlo Critchfield, *Associate Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1965, Pennsylvania State University; Ph.D. 1971, University of Illinois

Michael Charles Cullingford, *Associate Professorial Lecturer in Engineering*
B.Sc. 1961, University of Durham, England; M.Sc. 1966, King's College, England; Ph.D. 1975, North Carolina State University

Richard Lee Cunningham, *Assistant Professorial Lecturer in Engineering*
B.S. 1970, University of Virginia; M.S. 1976, George Washington University

John Severy Davies, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1966, New Mexico State University; M.S. in E.E. 1969, Ph.D. 1979, Iowa State University

Edward Della Torre, *Professor of Engineering and Applied Science*
B.E.E. 1954, Polytechnic Institute of New York; M.S. 1956, Princeton University; M.D. 1961, Rutgers—The State University; D.Eng.Sc. 1964, Columbia University

Robert Dillon, *Professorial Lecturer in Engineering*
B.A. 1949, University of Washington; M.A. in Arch. 1952, University of Florida

James Feaning Dinwiddie, *Associate Professor of Engineering Administration*
B.S. 1948, Carnegie Institute of Technology; M.S. 1956, North Carolina State University; M.S. 1966, Ph.D. 1972, Stanford University

Louis Divone, *Professorial Lecturer in Engineering*
B.Ae.E. 1955, Polytechnic Institute of New York; M.S. 1956, Massachusetts Institute of Technology

Roger W. Doyon, *Assistant Professorial Lecturer in Engineering*
B.S. in C.E. 1957, University of New Hampshire; M.E.A. 1964, George Washington University

Norman Abbott Dresner, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, Rensselaer Polytechnic Institute; M.A. 1965, Yeshiva University

John Edward Duberg, *Adjunct Professor of Engineering Administration*
B.S. 1938, Manhattan College; M.S. 1940, Virginia Polytechnic Institute and State University; Ph.D. 1948, University of Illinois

Charles Earl Dunham, *Professorial Lecturer in Engineering*
B.S. 1963, Rochester Institute of Technology; M.S. in E.E. 1966, Ph.D. 1972, Syracuse University

Jules Berthold Du Peza, *Professorial Lecturer in Engineering*
B.S. 1949, U.S. Coast Guard Academy; M.S. 1964, Naval Postgraduate School

Douglas Leon Dwoyer, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, M.S. 1967, Ph.D. 1975, Virginia Polytechnic Institute and State University

Dave E. Eckhardt, Jr., *Assistant Professorial Lecturer in Engineering and Applied Science*
B.S.E.E. 1962, Virginia Polytechnic and State University; M.S. 1973, Ph.D. 1979, George Washington University

Donald Ray Edmonds, *Associate Professorial Lecturer in Engineering*
B.S. in M.E., B.A. 1960, Rutgers—The State University; M.S. 1966, Ph.D. 1973, Ohio State University

Rajendra Bernard Edwards, *Professorial Lecturer in Engineering and Applied Science*
B.Engr. 1959, University of Jabalpur, Madhya Pradesh, India; M.Engr. 1961, Indian Institute of Science

John Eftis, *Professor of Engineering and Applied Science and Adjunct Professor of Applied Mathematics*
B.C.E. 1952, City University of New York, City College; M.S.C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

Marvin F. Eisenberg, *Professor of Engineering and Applied Science*
B.S. in E.E. 1953, University of Miami; M.S. in Engr. 1954, Ph.D. 1961, University of Florida

William John Eisner, *Professorial Lecturer in Engineering*
B.A. 1962, Cornell University

Donald W. Ellison, *Associate Professorial Lecturer in Engineering*
B.S. 1948, Tri-State College; M.P.A. 1951, Cornell University

Diana Marie Engel, *Assistant Professorial Lecturer in Engineering*
B.A. 1965, Goucher College; M.S. 1979, George Washington University

Wayne Douglas Erickson, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Michigan State University; M.S. 1958, D.Sc. 1962, Massachusetts Institute of Technology

Donald Michael Esterling, *Professor of Engineering*
B.S. 1964, University of Notre Dame; M.A. 1966, Ph.D. 1968, Brandeis University

Peter Jon Evanovich, *Associate Professorial Lecturer in Engineering*
A.B. 1963, M.S. 1965, Ph.D. 1970, Rutgers—The State University

Robert Henry Evans, *Assistant Professorial Lecturer in Engineering*
B.S. 1970, M.S. 1971, Duke University; D.Sc. 1975, George Washington University

James Edward Falk, *Professor of Operations Research*
B.E.E. 1960, University of Detroit; M.S. 1961, Ph.D. 1965, University of Michigan

Fereidoun Farassat, *Associate Professorial Lecturer in Engineering*
B.E. 1967, American University of Beirut; M.S. 1970, Ph.D. 1973, Cornell University

James Elmer Feir, *Professor of Civil Engineering; Associate Dean of the School of Engineering and Applied Science*
B.S. 1950, University of Alberta, Canada; M.S. 1955, University of London, England; Ph.D. 1966, Cambridge University, England

David Feit, *Associate Professorial Lecturer in Engineering*
A.B. 1958, B.S. 1959, M.S. 1961, Eng.Sc.D. 1964, Columbia University

Michael Bliss Feldman, *Associate Professor of Engineering and Applied Science*
B.S.E. 1966, Princeton University; M.S.E. 1970, Ph.D. 1973, University of Pennsylvania

Anthony Vincent Fiacco, *Professor of Operations Research and Applied Science*
B.A. 1950, Union College, New York; Ph.D. 1967, Northwestern University

Larry Allen Fletcher, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1959, Colorado State University; M.S. in E.E. 1961, Massachusetts Institute of Technology

James David Foley, *Professor of Engineering and Applied Science*
B.S. 1964, Lehigh University; M.S. 1965, Ph.D. 1969, University of Michigan

Charles William Fotis, *Professorial Lecturer in Engineering*
A.B. 1937, M.A. 1939, Tufts University; Ph.D. 1959, American University

Edwin C. Foudriat, *Associate Professorial Lecturer in Engineering and Applied Science*
B.S. 1960, University of Illinois; M.S. 1965, Ph.D. 1966, Ohio State University

Paul Jeffery Fox, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, Yale University; M.S. 1973, Massachusetts Institute of Technology

Raymond Richard Fox, *Professor of Engineering and Applied Science*
B.S. in C.E. 1949, M.S. in C.E. 1952, University of Washington

Robert William Fralich, *Associate Professorial Lecturer in Engineering*
B.Ae.E. 1947, University of Cincinnati; M.Ae.E. 1952, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Gabriel Frenkel, *Professorial Lecturer in Engineering*
B.S. 1956, Cooper Union; M.S. 1960, City University of New York, City College; Ph.D. 1972, George Washington University

Arthur D. Friedman, *Professor of Engineering and Applied Science*
B.A. 1961, B.S. in E.E. 1962, M.S. in E.E. 1963, Ph.D. 1965, Columbia University

Fred Frishman, *Adjunct Professor of Operations Research and Applied Science*
B.B.A. 1947, City University of New York, City College; A.B. 1956, M.A. 1957, Ph.D. 1971, George Washington University

Martin Fritts, *Assistant Professorial Lecturer in Engineering*
B.S. 1965, Holy Cross College; M.S. 1966, M.Phil. 1968, Ph.D. 1972, Yale University

Yuen-sun Fu, *Assistant Professorial Lecturer in Engineering*
B.S. 1955, Taipei Institute of Technology; M.S. 1959, Kansas State University; Ph.D. 1975, University of Kansas

Robert Earle Fulton, *Professorial Lecturer in Engineering*
B.S. 1953, Auburn University; M.S. 1958, Ph.D. 1960, University of Illinois

Michael John Furman, *Assistant Professorial Lecturer in Engineering*
B.S.M.E. 1970, New York College of Engineering; M.S.M.E. 1972, University of California

Charles Alexander Garris, *Associate Professor of Engineering*
B.E. 1965, State University of New York, Maritime College; M.S. 1968, Ph.D. 1971, State University of New York at Stony Brook

Michael Paul Gaus, *Adjunct Professor of Engineering*
B.S. 1954, M.S. 1956, Ph.D. 1959, University of Illinois

Amritpal Singh Gill, *Associate Professorial Lecturer in Engineering*
B.S.E.E. 1963, Howard University; M.S. 1965, George Washington University

Harcharan Singh Gill, *Associate Professorial Lecturer in Engineering*
B.Eng. 1964, University of Malaya; M.S. 1967, University of Hawaii; Ph.D. 1971, Cornell University

Charles Matthew Gilmore, *Professor of Engineering and Applied Science*
B.S. 1963, M.S. 1964, Pennsylvania State University; Ph.D. 1971, University of Maryland

Neal David Glassman, *Professorial Lecturer in Engineering and Applied Science*
B.S. 1964, Case Institute of Technology; M.A. 1966, Ph.D. 1968, Yale University

Michael Stanley Gluck, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, City University of New York, City College; M.S. 1963, New York University; D.Sc. 1978, George Washington University

Walter Anthony Goetz, *Associate Professorial Lecturer in Engineering*
B.S.(M.E.) 1960, Michigan State University; M.E.A. 1974, George Washington University

Ambrose Goicoechea, *Associate Research Professor of Engineering*
B.S. 1966, California State Polytechnic University, Pomona; M.S. 1970, California State University, Los Angeles; Ph.D. 1977, University of Arizona

Herbert Goldsmith, *Professorial Lecturer in Engineering*
B.Ch.E. 1940, City University of New York, City College; M.S. 1949, Ph.D. 1953, George Washington University

Yoram Gordon, *Adjunct Professor of Engineering*
B.S. 1953, University of California, Berkeley; M.S. 1968, Ph.D. 1970, University of Arizona

Robert Goulard, Professor of Engineering and Applied Science
Ph.D. 1957, Purdue University

Truman Lewis Griswold, *Assistant Professorial Lecturer in Engineering*
B.S.Aero.E. 1949, University of Cincinnati; M.E.A. 1964, George Washington University

Donald Gross, *Professor of Operations Research*
B.S. 1956, Carnegie-Mellon University; M.S. 1959, Ph.D. 1962, Cornell University

Donald Urban Gubser, *Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1964, Ph.D. 1969, University of Illinois

Richard N. Gurley, *Assistant Professorial Lecturer in Engineering*
B.Ch.E. 1958, M.S. (Ch.E.) 1959, North Carolina State University, M.E. 1964, Ph.D. 1967, University of Florida

Andrew Lyon Haines, *Professorial Lecturer in Engineering*
A.B. 1964, Princeton University, M.A.T. 1965, Harvard University, M.S. 1968, Stanford University, D.Sc. 1973, George Washington University

John Frederick Halldane, *Professorial Lecturer in Engineering*
B.S. 1959, B.Arch. 1961, University of New Zealand, Ph.D. 1968, University of Auckland, New Zealand

Michael Joseph Hanley, *Assistant Professorial Lecturer in Engineering*
B.S. 1958, U.S. Naval Academy; M.S. 1971, Naval Postgraduate School

Barry Wellesley Hannah, *Adjunct Professor of Engineering*
B.S. 1963, M.S. 1965, Ph.D. 1973, University of Cincinnati

Robert Joseph Harrington, *Associate Professor of Engineering*
B.S. 1962, Ph.D. 1965, University of Liverpool, England

Wesley L. Harris, *Professorial Lecturer in Engineering*
B.Aero.Engr. 1964, University of Virginia, M.A. 1966, Ph.D. 1968, Princeton University

V. Robert Hayles, *Associate Professorial Lecturer in Engineering and Applied Science*
B.A. 1970, M.A. 1972, University of Kansas; Ph.D. 1974, University of Colorado

Donald P. Hearth, *Professorial Lecturer in Engineering*
B.S. 1951, Northeastern University

Hermann Josef Helgert, *Professor of Engineering and Applied Science*
B.S. 1962, M.S. 1964, Ph.D. 1966, State University of New York at Buffalo

Robert Bernard Heller,* *Professor of Engineering and Applied Science*
B.S. 1946, M.S. 1948, Ph.D. 1951, St. Louis University

Robert Alexander Hemmes, *Professorial Lecturer in Engineering*
B.S. 1947, U.S. Naval Academy, M.S. 1956, Massachusetts Institute of Technology, Ph.D. 1969, Stanford University

Thomas Pendleton Henry, *Assistant Professorial Lecturer in Engineering*
B.E.E. 1957, Georgia Institute of Technology, M.S. 1979, George Washington University

Robert Alexander Herring, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1936, M.S. 1938, Georgetown University

George E. Hicho, *Assistant Professorial Lecturer in Engineering*
B.S. 1960, University of Pittsburgh; M.S. 1977, George Washington University

Edward Sanderson Hoe, *Professorial Lecturer in Engineering*
B.A. 1969, Colby College; J.D. 1973, Cornell University

Karla R. Hoffman, *Associate Professorial Lecturer in Engineering*
B.A. 1969, Rutgers—The State University, M.B.A. 1971, D.Sc. 1975, George Washington University

Lance Joel Hoffman, *Associate Professor of Engineering and Applied Science*
B.S. 1964, Carnegie-Mellon University; M.S. 1967, Ph.D. 1970, Stanford University

Douglas LeRoy Hogan, *Professorial Lecturer in Engineering*
B.S. 1950, George Washington University, M.S. 1954, E.E. 1961, Massachusetts Institute of Technology

Richard Frank Hoglund, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Ph.D. 1960, Northwestern University

Gerald M. Hollander, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1949, University of South Carolina, M.A. 1965, George Washington University

Alexander Hoshovsky, *Professorial Lecturer in Engineering*
B.A. 1952, Saint Mary's University of Texas, M.A. 1963, George Washington University, Ph.D. 1973, American University

Wen H. Huang, *Professorial Lecturer in Engineering*
B.S.(C.E.), National Taiwan University; M.S.(C.E.), Ph.D., University of Illinois

Hing-Loi A. Hung, *Professorial Lecturer in Engineering*
B.S. 1968, Massachusetts Institute of Technology, M.S. 1970, Ph.D. 1974, Cornell University

Timothy Ray Husson, *Assistant Professorial Lecturer in Engineering*
B.E.(E.E.) 1976, Manhattan College

Seong T. Hwang, *Associate Professorial Lecturer in Engineering*
B.S.(Ch.E.) 1961, M.S.(Ch.E.) 1963, Ph.D.(Ch.E.) 1966, University of Michigan

M. Ashraf Imam, *Assistant Professorial Lecturer in Engineering*
B.S. 1965, Regional Institute of Technology, Ranchi University, India, M.S. 1972, Carnegie-Mellon University; D.Sc. 1978, George Washington University

* On sabbatical leave 1983 fall semester

John Frederic Ince, *Associate Professorial Lecturer in Engineering*
B.S. 1966, Webb Institute of Naval Architecture; M.S. 1968, Massachusetts Institute of Technology; M.S. 1972, D.Sc. 1978, George Washington University

Casimir Joseph Jachimowski, *Associate Professorial Lecturer in Engineering*
B.S. 1960, DePaul University; Ph.D. 1964, Michigan State University

William D. Jackson, *Professorial Lecturer in Engineering*
B.Sc. 1947, Ph.D. 1960, Glasgow University, Scotland; A.R.C.S.T. 1948, University of Strathclyde, England

James Weldon Johnson, *Associate Professorial Lecturer in Engineering*
B.S. 1963, Prairie View A&M College; M.A. 1970, University of Maryland; D.Sc. 1981, George Washington University

Douglas Linwood Jones,* *Professor of Engineering*
B.M.E. 1963, M.S.E. 1965, D.Sc. 1970, George Washington University

Kay Howard Jones, *Professorial Lecturer in Engineering*
B.S. 1956, University of Washington; M.S. 1961, Ph.D. 1968, University of California, Berkeley

Walter Kurt Kahn,* *Professor of Engineering and Applied Science*
B.E.E. 1951, Cooper Union; M.E.E. 1954, D.E.E. 1960, Polytechnic Institute of New York

Stephen H. Kaisler, *Assistant Professorial Lecturer in Engineering*
B.S. 1972, M.S. 1975, University of Maryland

Sherman Karp, *Professorial Lecturer in Engineering*
B.S.E.E. 1960, M.S./E.E. 1962, Massachusetts Institute of Technology; Ph.D. 1967, University of Southern California

Roger Emanuel Kaufman,† *Professor of Engineering*
B.S. 1962, Tufts University; M.F.A. 1965, Yale University; M.E. 1968, Ph.D. 1969, Rensselaer Polytechnic Institute

John Kaye, *Professor of Engineering and Applied Science*
B.S. in M.E. 1939, M.S. in M.E. 1948, California Institute of Technology

Azer Kehnemui, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Robert College, Turkey; M.S. 1963, University of Illinois; D.Sc. 1975, George Washington University

Peter M. Kelly, *Professorial Lecturer in Engineering*
B.S. 1950, Union College, New York; M.S. 1952, Ph.D. 1960, California Institute of Technology

William John Kenis, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1955, Widener College; M.S. in C.E. 1957, University of Connecticut

Ram K. Khatri, *Professorial Lecturer in Engineering*
B.S. 1952, Agra University, India; B.E. 1956, Sagar University; M.S. 1961, Lehigh University; Ph.D. 1971, University of Maryland

Khalilollah Khozeimeh, *Associate Professorial Lecturer in Engineering and Applied Science*
B.C.E. 1965, M.S.E. 1967, D.Sc. 1974, George Washington University

H. Steven Kimmel, *Assistant Professorial Lecturer in Engineering*
B.S. 1968, University of Maryland; M.E.A. 1972, George Washington University

Ali Muhlis Kiper, *Professor of Engineering*
M.S. in M.E. 1950, Technical University of Istanbul, Turkey; M.S. in M.E. 1954, Ph.D. 1956, Purdue University

Vladislav Klein, *Research Professor of Engineering*
Mech. Engr. 1954, Technical University, Czechoslovakia; Ph.D. 1974, Cranfield Institute of Technology, England

Charles Eugene Knadler, Jr., *Assistant Professorial Lecturer in Engineering*
B.E.S. 1965, Johns Hopkins University

Joseph Alexander Knight, *Associate Professorial Lecturer in Engineering*
B.S.E.E. 1963, Virginia Polytechnic Institute and State University; M.S./E.E. 1965, Ph.D. 1968, Georgia Institute of Technology

Stephen Jeffrey Koch, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Memphis State University

Abdel Kader Kotb, *Professorial Lecturer in Engineering*
B.S. 1957, Cairo University; M.S. 1961, Ph.D. 1964, University of Oklahoma

Clifford Alfons Kottman, *Associate Professorial Lecturer in Engineering*
B.S. 1964, Loyola Marymount University; M.S. 1966, Ph.D. 1969, University of Iowa

Joseph Daniel Kotulski, *Assistant Professorial Lecturer in Engineering*
B.S. 1975, M.S. 1977, University of Illinois Chicago Circle

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* On sabbatical leave 1984 spring semester
† On sabbatical leave 1983 fall semester

Gerald Joseph Kowalski, *Associate Professorial Lecturer in Engineering*
B.S. 1968, Marshall University; M.S. 1970, University of Arkansas

Robert J. Kurzeja, *Assistant Research Professor of Applied Science*
B.A. 1967, University of Chicago; M.S. 1970, Ph.D. 1976, Florida State University

Nicholas Kyriakopoulos, *Associate Professor of Engineering*
B.E.E. 1960, M.S. in Engr. 1963, D.Sc. 1968, George Washington University

Paul A. Lamb, *Assistant Professorial Lecturer in Engineering*
B.S.-E.E. 1960, University of Arizona, M.B.A. 1973, University of California, Los Angeles, D.Sc. 1982, George Washington University

Harry Hill Landon, *Professorial Lecturer in Engineering*
B.S. 1944, M.S. 1948, Case Western Reserve University, Ph.D. 1951, Yale University

Roger Henry Lang, *Professor of Engineering and Applied Science*
B.S.E.E. 1962, M.S.E.E. 1964, Ph.D. 1968, Polytechnic Institute of New York

George Robert Lawrence, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1964, Widener College, M.S. in E.E. 1973, Engr. 1978, George Washington University

Robert Edward Lawrence, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1968, M.S. 1969, Ph.D. 1972, Rensselaer Polytechnic Institute

Jhong Sam Lee, *Professorial Lecturer in Engineering*
B.S. in E.E. 1959, University of Oklahoma, M.S. in E.E. 1961, D.Sc. 1967, George Washington University

Robert Lee, *Assistant Professorial Lecturer in Engineering*
B.S. 1972, George Washington University

Ting N. Lee,* *Professor of Engineering and Applied Science*
B.S.E.E. 1962, Cheng Kung University, Taiwan, M.S.E.E. 1965, Illinois Institute of Technology, Ph.D. 1972, University of Wisconsin

Lawrence Martin Leibowitz, *Professorial Lecturer in Engineering*
B.S. 1960, M.S. 1964, New York University, D.Sc. 1978, George Washington University

Eugene Barry Leiderman, *Assistant Professorial Lecturer in Engineering*
B.A. 1965, M.L.S. 1967, University of Maryland, M.S. 1970, Ohio State University

Stephen B. Leighton, *Associate Professorial Lecturer in Engineering*
B.S. 1968, Yale University, M.S. 1969, D.Sc. 1976, Massachusetts Institute of Technology

Guy William Leonard, *Professorial Lecturer in Engineering*
B.S. in Chem. 1945, M.A. in Chem. 1946, Indiana University, Ph.D. in Chem. 1949, Massachusetts Institute of Technology

Raymond Joseph Leopold, *Professorial Lecturer in Engineering*
B.S. 1967, U.S. Air Force Academy, M.E.E. 1968, North Carolina State University, Ph.D. 1973, University of New Mexico

David Richard Levin, *Professorial Lecturer in Engineering*
B.A. 1934, M.A. 1936, J.D. 1936, Ph.D. 1937, University of Wisconsin

David Michael LeVine, *Associate Professorial Lecturer in Engineering*
B.S.E. 1963, M.S.E. 1964, M.S. 1966, Ph.D. 1968, University of Michigan

Herbert Arthur Leybold, *Associate Professorial Lecturer in Engineering*
B.C.E. 1955, Polytechnic Institute of New York, M.S. in M.E. 1963, Virginia Polytechnic Institute and State University; Ph.D. 1969, North Carolina State University at Raleigh

Harold Liebowitz, *Professor of Engineering and Applied Science; Dean of the School of Engineering and Applied Science*
B.Ae.E. 1944, M.Ae.E. 1946, D.Ae.E. 1948, Polytechnic Institute of New York

Shih-Chi Liu, *Professorial Lecturer in Engineering*
B.S. 1960, National Taiwan University, M.S. 1964, Ph.D. 1967, University of California, Berkeley

John D. Liveris, *Assistant Professorial Lecturer in Engineering*
B.S.M.E. 1974, Tufts University; M.E.A. 1976, George Washington University

Thomas Phillip George Liverman, *Professor of Mathematics and Adjunct Professor of Engineering and Applied Science*
B.A. 1941, University of Montpellier, France, M.A. 1948, Ph.D. 1956, University of Pennsylvania

David D. Loendorf, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, M.S. 1971, Old Dominion University; M.S. 1974, University of Michigan

Murray Howard Loew, *Associate Professor of Engineering*
B.S.(E.E.) 1965, Drexel University; M.S.(E.E) 1967, Ph.D. 1972, Purdue University

Laurence Keith Loftin, Jr., *Professorial Lecturer in Engineering*
B.M.E. 1943, University of Virginia

Edward R. Long, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1967, College of William and Mary, Ph.D. 1974, North Carolina State University

---

* On sabbatical leave 1983 fall semester.

Gerald Dean Love, *Professorial Lecturer in Engineering*
B.S. in C.E. 1949, M.S. in C.E. 1956, Iowa State University; D.Eng. 1975, Rensselaer Polytechnic Institute

Robert John Lynch, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1963, Naval Postgraduate School; M.E.A. 1975, George Washington University

Gordon Edward Lyon, *Associate Professorial Lecturer in Engineering*
B.S. 1964, Michigan Technological University; M.S. 1966, M.S. 1967, Ph.D. 1972, University of Michigan

Khalid Mahmood, *Professor of Engineering*
B.A. 1950, B.S. 1953, Panjab University, Pakistan; M.S. 1964, University of Washington; Ph.D. 1971, Colorado State University

George T. Malley, *Professorial Lecturer in Engineering*
B.A. 1936, University of Rochester; J.D. 1948, Cornell University

Clara F.M. Hong Manders, *Associate Professorial Lecturer in Engineering*
B.A. 1962, Polytechnic Institute of New York; M.S. 1965, Northeastern University; M.S. in Engr. 1968, University of Florida

Arthur Frank Manfredi, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1965, Cooper Union; M.S. 1968, Polytechnic Institute of New York; D.Sc. 1975, George Washington University

Michael J. Marcus, *Professorial Lecturer in Engineering*
B.S. 1968, D.Sc. 1972, Massachusetts Institute of Technology

J. Richard Margulies, *Associate Professorial Lecturer in Engineering*
B.S. 1967, Cornell University; M.E.A. 1971, George Washington University; J.D. 1974, Georgetown University

William Henry Marlow, *Professor of Operations Research*
B.S. 1947, St. Ambrose College; M.S. 1948, Ph.D. 1951, University of Iowa

Ward Douglas Maurer, *Professor of Engineering and Applied Science*
B.S. 1958, University of Chicago; M.A. 1962, Ph.D. 1965, University of California, Berkeley

Paul D. Maycock, *Professorial Lecturer in Engineering*
B.S. 1957, M.S. 1962, Iowa State University

Richard McConnell, *Associate Professorial Lecturer in Engineering*
B.C.E. 1950, George Washington University; M.S. 1960, University of Illinois; Ph.D. 1974, Catholic University of America

Garth Philip McCormick,* *Professor of Applied Science*
B.A. 1956, Oberlin College; M.A. 1959, University of Michigan

Paul Franklin McCoy, *Associate Professorial Lecturer in Engineering*
B.A. 1967, Harvard University; M.S. 1969, Ph.D. 1976, Stanford University

Terrence Patrick McGarty, *Professorial Lecturer in Engineering*
B.E. 1965, Manhattan College; M.S. 1966, E.E. 1969, Ph.D. 1971, Massachusetts Institute of Technology

Gerald Robert McNichols, *Professorial Lecturer in Engineering*
B.S. 1965, Case Western Reserve University; M.S. 1966, University of Pennsylvania; D.Sc. 1976, George Washington University

Subhash C. Mehrotra, *Associate Professorial Lecturer in Engineering*
B.Tech. 1959, I.I.T. Kharagpur, India; M.S. 1967, University of Iowa, Ph.D. 1973, University of California

Arnold Charles Meltzer, *Professor of Engineering and Applied Science*
B.S. in Engr. 1958, M.S. in Engr. 1961, D.Sc. 1967, George Washington University

David John Michel, *Professorial Lecturer in Engineering*
B.S. 1964, University of Missouri, Rolla; M.S. 1966, Ph.D. 1968, Pennsylvania State University

Martin Milton Mikulas, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1964, Ph.D. 1970, Virginia Polytechnic Institute and State University

Bennett Miller, *Professorial Lecturer in Engineering*
B.A. 1959, M.A. 1961, Ph.D. 1965, Columbia University

Douglas Rathke Miller, *Associate Professor of Operations Research*
B.S. 1966, Carnegie-Mellon University; M.A. 1969, Ph.D. 1971, Cornell University

Manouchehr Mohajeri, *Professorial Lecturer in Engineering*
B.Sc. 1964, Tehran University, Iran; M.Sc. 1968, Sc.D. 1977, Massachusetts Institute of Technology

David Dunston Moran, *Professorial Lecturer in Engineering*
B.S. 1965, M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1971, University of Iowa

Joseph David Morgan, Jr., *Professorial Lecturer in Engineering*
B.S. 1959, U.S. Air Force Academy; M.S. 1968, Ph.D. 1974, Georgia Institute of Technology

Daniel R. Mulville, *Assistant Professorial Lecturer in Engineering*
B.S. in M.E. 1962, M.S. 1966, George Washington University; Ph.D. 1974, Catholic University of America

---

* On sabbatical leave 1983 fall semester.

Michael Kenneth Myers, *Professor of Engineering and Applied Science*
B.A. 1962, Willamette University; B.S. 1962, M.S. 1963, Ph.D. 1966, Columbia University

Mysore S. Nataraja, *Associate Professorial Lecturer in Engineering*
B.S. (C.E.) 1965, Bangalore University, India; M.S. 1967, Indian Institute of Technology; Ph.D. 1973, University of Pittsburgh

Edgar Henry Neal, *Assistant Professorial Lecturer in Engineering*
B.S. E.E. 1958, Pennsylvania State University; M.S. E.E. 1976, George Washington University

S. Edward Nevius, *Associate Professorial Lecturer in Engineering*
B.A. 1967, University of Kansas; M.S. 1969, Kansas State University; Ph.D. 1975, Florida State University

Christopher Ng, *Associate Professorial Lecturer in Engineering*
B.S. 1944, Chiao-Tung University, China; M.S. 1959, University of Connecticut; Ph.D. 1973, University of Maryland

Ahmed Khairy Noor, *Professor of Engineering and Applied Science*
B.S. 1958, Cairo University, Egypt; M.S. 1961, Ph.D. 1963, University of Illinois

Walter Robert Nunn, *Professorial Lecturer in Engineering*
B.A. 1957, M.A. 1961, University of California, Berkeley; Ph.D. 1972, George Washington University

Barry David Nussbaum, *Associate Professorial Lecturer in Engineering*
B.S. 1968, Rensselaer Polytechnic Institute; M.S. 1971, D.Sc. 1978, George Washington University

John Francis O'Dea, *Assistant Professorial Lecturer in Engineering*
B.S. 1968, Webb Institute of Naval Architecture; M.S. 1970, Ph.D. 1974, Massachusetts Institute of Technology

Morris Solomon Ojalvo, *Professorial Lecturer in Engineering*
B.M.E. 1944, Cooper Union; M.M.E. 1949, University of Delaware; Ph.D. 1962, Purdue University

Lin-Sen Pan, *Associate Professorial Lecturer in Engineering*
B.S. (Ch.E.) 1960, National Cheng Kung University, Taiwan; M.S. 1964, Ph.D. 1967, University of Utah

Francis P. Pantuso, *Associate Professorial Lecturer in Engineering*
B.E.E. 1963, Manhattan College; M.S. in E.E. 1965, Newark College of Engineering; Ph.D. 1973, Polytechnic Institute of New York

Stephen Kent Park, *Associate Professorial Lecturer in Engineering*
B.S. 1964, Shippensburg State College; M.S. in Applied Math. 1967, Ph.D. 1970, North Carolina State University at Raleigh

S. F. Pauls, *Assistant Professorial Lecturer in Engineering*
B.A. 1958, College of William and Mary; M.S.A. 1970, George Washington University

Raymond L. Pickholtz, *Professor of Engineering and Applied Science*
B.E.E. 1954, M.E.E. 1958, City University of New York, City College; Ph.D. 1966, Polytechnic Institute of New York

Larry D. Pinson, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1963, University of Kentucky; Ph.D. 1973, Virginia Polytechnic Institute and State University

Joseph L. Pokorney, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, University of Wisconsin; M.S. 1967, Northeastern University

Robert S. Polvani, *Associate Professorial Lecturer in Engineering*
B.S. 1959, M.S. 1965, Massachusetts Institute of Technology; Ph.D. 1975, University of Connecticut

Pathickal Kuriakose Poulose, *Associate Research Professor of Engineering*
B.S. 1959, University of Kerala, India; B.E. 1965, M.E. 1967, Indian Institute of Science; Ph.D. 1973, University of Connecticut

Manuel Jack Queijo, *Professorial Lecturer in Engineering*
B.S. 1944, Worcester Polytechnic Institute; M.S. 1954, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Alvin Radkowsky, *Research Professor of Applied Science*
B.S.E., City University of New York, City College; A.M. 1942, George Washington University; Ph.D. 1947, Catholic University of America

Walter Phillip Reid, *Adjunct Professor of Engineering*
B.S. 1938, M.S. 1939, Carnegie-Mellon University; Ph.D. 1942, University of Pittsburgh

Robert Bruce Reynolds, *Assistant Professorial Lecturer in Engineering*
B.A. 1965, Emory and Henry College; M.C.S. 1970, University of Virginia; M.S. 1974, George Washington University

Ulrich L. Rhode, *Adjunct Professor of Engineering and Applied Science*
M.S. 1962, Gisela College of General Science, Germany

Ferdinand Joseph Ricci, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1962, Michigan State University; M.S. in E.E. 1966, Newark College of Engineering; Ph.D. 1973, Catholic University of America

David Caron Roberts, *Associate Professorial Lecturer in Engineering*
B.S. 1965, Johns Hopkins University; M.S.E. 1968, University of Pennsylvania; M.S. 1973, University of Maryland

James L. Rogers, *Assistant Professorial Lecturer in Engineering and Applied Science*
B.S. 1968, Auburn University; M.S. 1973, College of William and Mary; M.S.A. 1978, George Washington University

Derrill Conway Rohlfs, *Associate Professor of Engineering and Applied Science*
B.E.E. 1955, M.S. in Engr. 1969, George Washington University

Peter David Rosenberg, *Associate Professorial Lecturer in Engineering*
B.A. 1962, B.Ch.E. 1963, New York University; J.D. 1968, New York Law School; LL.M. 1971, George Washington University

Sam Rothman, *Professor of Engineering Administration*
B.S. 1943, Long Island University; M.A. 1954, Ph.D. 1959, American University

Leon Scharff, *Professorial Lecturer in Engineering*
B.S. 1942, City University of New York, City College; B.S. E.E. 1947, Massachusetts Institute of Technology; M.S. (E.E.) 1952, University of Maryland

Allan Schneider, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1959, B.S.E.P. 1960, Lehigh University; M.S. in E.E. 1962, Columbia University; Ph.D. 1974, University of Maryland

James H. Schulman, *Research Professor of Engineering*
B.S. 1939, Ph.D. 1942, Massachusetts Institute of Technology

Benjamin L. Schwartz, *Professorial Lecturer in Engineering*
B.S. 1945, M.S. 1946, Carnegie-Mellon University; Ph.D. 1965, Stanford University

Joseph John Seppy, *Assistant Professorial Lecturer in Engineering*
B.E. 1973, Villanova University; M.S. 1981, George Washington University

Homer Belk Sewell, *Professor of Engineering Administration*
B.S. 1945, U.S. Naval Academy; M.E.A. 1958, George Washington University; M.A. 1975, Ph.D. 1978, University of Lancaster

Shihab A. Shamma, *Assistant Professorial Lecturer in Engineering*
B.Sc. 1976, Imperial College, England; M.S. 1977, M.A. Ph.D. 1980, Stanford University

Presson Scott Shane, *Professor of Engineering Administration*
B.S. in Ch.E. 1941, University of Kansas; M.S. in Ch.E. 1946, Massachusetts Institute of Technology

Ramesh Shankar, *Assistant Professorial Lecturer in Engineering*
B.Tech. 1969, Indian Institute of Technology; M.E.E. 1972, Ph.D. 1978, University of Delaware

Francis William Shepherd, *Associate Professorial Lecturer in Engineering*
B.S. 1949, City University of New York, City College; M.S. 1950, University of Minnesota; M.E.A. 1960, D.Sc. 1977, George Washington University

John N. Shoosmith, *Assistant Professorial Lecturer in Engineering*
B.Sc. 1956, Queens University, Ontario, Canada; M.S. 1967, College of William and Mary; Ph.D. 1973, University of Virginia

John Edward Shore, *Professorial Lecturer in Engineering*
B.S. 1968, Yale University; Ph.D. 1974, University of Maryland

John Lee Sibert, *Associate Research Professor of Engineering*
A.B. 1968, Wittenberg University; M.A. 1971, Miami University, Ohio; Ph.D. 1974, University of Michigan

Barry Silverman, *Associate Professor of Engineering*
B.S.E. 1975, M.S.E. 1977, Ph.D. 1977, University of Pennsylvania

Joseph Robert Silverman, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1959, Northeastern University; M.S. 1968, D.Sc. 1977, George Washington University

Nozer Darabsha Singpurwalla, *Professor of Operations Research and of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S. 1964, Rutgers—The State University; Ph.D. 1968, New York University

Earl Franklin Skelton, *Professorial Lecturer in Engineering*
B.S. 1962, Fairleigh Dickinson University; Ph.D. 1967, Rensselaer Polytechnic Institute

David Russell Smith, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Randolph-Macon College; M.S. E.E. 1970, Georgia Institute of Technology; D.Sc. 1977, George Washington University

Richard E. Snyder, *Assistant Professorial Lecturer in Engineering and Applied Science*
B.S. 1962, University of Nebraska; M.S. 1965, Ph.D. 1971, Virginia Polytechnic Institute and State University

Richard Martin Soland, *Professor of Operations Research*
B.E.E. 1961, Rensselaer Polytechnic Institute; Ph.D. 1964, Massachusetts Institute of Technology

John Paul Solomond, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1971, M.S. in E.E. 1972, Carnegie-Mellon University, Ph.D. 1976, Texas A&M University

Bland A. Stein, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, City University of New York, City College, M.S. 1964, Virginia Polytechnic Institute and State University

Manuel Stein, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1943, University of Pittsburgh, M.Ae.E. 1951, University of Virginia, Ph.D. 1958, Virginia Polytechnic Institute and State University

Henry Malcolm Steiner, *Professor of Engineering Administration*
B.A. in M.E. 1944, M.S. in C.E. 1950, Ph.D. 1965, Stanford University

Kenneth Sutton, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, M.S. 1964, University of Florida, M.S. 1967, George Washington University, Ph.D. 1973, North Carolina State University

Roy C. Swanson, Jr., *Assistant Professorial Lecturer in Engineering*

Willard Lucian Taylor III, *Assistant Professorial Lecturer in Engineering*
B.S.M.E. 1967, M.S.I.E. 1975, University of Rhode Island, M.E.-Mgt. 1976, Boston University

Darrell Ray Tenney, *Associate Professorial Lecturer in Engineering*
B.S. 1964, West Virginia Wesleyan College, Ph.D. 1969, Virginia Polytechnic Institute and State University

Samuel Coakley Tignor, *Professorial Lecturer in Engineering*
B.S.C.E. 1958, Virginia Polytechnic Institute and State University, C.E. 1966, Catholic University of America, M.S.E. 1970, Ph.D. 1974, University of Michigan

Robert Yen-ying Ting, *Associate Professorial Lecturer in Engineering*
B.S. 1964, National Taiwan University, M.S. 1967, Massachusetts Institute of Technology, Ph.D. 1971, University of California, San Diego

Theodore George Toridis, *Professor of Engineering and Applied Science*
B.S. 1954, Robert College, Turkey, M.S. 1961, Ph.D. 1964, Michigan State University

Avtar Krishan Trehan, *Adjunct Associate Professor of Engineering*
B.S. 1962, University of Allahabad, India, M.S. 1967, Brown University, Ph.D. 1971, University of Maryland

Robert Samuels Triplett, *Professorial Lecturer in Engineering*
B.S. 1940, University of Kentucky, M.A. 1943, University of Chicago, Ph.D. 1976, Laurence University

J. S. Tripp, *Assistant Professorial Lecturer in Engineering and Applied Science*
B.S. 1961, M.S. 1962, Kansas State University, M.S. 1967, Ph.D. 1971, University of Michigan

J. H. Tucker, *Assistant Professorial Lecturer in Engineering and Applied Science*
B.S.E.E. 1964, Mississippi State University, M.S.E.E. 1970, University of Virginia, Ph.D. 1974, Virginia Polytechnic Institute and State University

Warren Viessman, Jr., *Professorial Lecturer in Engineering*
B.E. 1952, M.S.E. 1958, D.Engr. 1961, Johns Hopkins University

Gerald David Walberg, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, M.S. 1963, Virginia Polytechnic Institute and State University, Ph.D. 1974, North Carolina State University

Eugene Allen Walker, *Assistant Professorial Lecturer in Engineering*
B.S. 1966, University of Maine; M.S. 1972, George Washington University

John D. Waller, *Professorial Lecturer in Engineering*
B.S. 1959, Rockhurst College, M.S. 1962, Ph.D. 1966, University of Notre Dame

Thomas Michael Walsh, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1953, Ohio University; M.S.E. 1962, University of Akron

Todd Leon Walton, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1970, University of Cincinnati, M.S. 1972, Ph.D. 1979, University of Florida

Chai-Ho Charles Wang, *Associate Professorial Lecturer in Engineering*
B.A. 1964, Fort Lewis College, M.A. 1968, University of Washington, Ph.D. 1974, University of Denver

Andrew B. Wardlaw, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1967, Bucknell University; M.S. 1968, Ph.D. 1971, University of Pennsylvania

Wasyl Wasylkiwskyj, *Professorial Lecturer in Engineering*
B.E.E. 1957, City University of New York, City College, M.S. in E.E. 1965, Ph.D. 1968, Polytechnic Institute of New York

Robert Charles Waters, *Professor of Engineering Administration*
B.S. 1956, M.B.A. 1963, University of California, Los Angeles, D.B.A. 1968, University of Southern California

John Richard Weggel, *Professorial Lecturer in Engineering*
B.S. 1964, Drexel University; M.S. 1966, Ph.D. 1968, University of Illinois

Benjamin Whang, *Professorial Lecturer in Engineering*
B.C.E. 1959, M.C.E. 1961, Polytechnic Institute of New York, Ph.D. 1968, Massachusetts Institute of Technology

John Lindsey Whitesides, Jr., *Professor of Engineering and Applied Science*
B.S. 1965, Ph.D. 1968, University of Texas

Frank Leroy Willingham, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1961, University of Florida; M.S. 1976, University of Maryland

Michael Barron Wilson, *Assistant Professorial Lecturer in Engineering*
B.S.E. 1963, M.S. 1965, University of Michigan; Ph.D. 1971, California Institute of Technology

Charles Winklehaus, *Associate Professorial Lecturer in Engineering*
B.C.E. 1951, M.C.E. 1957, Polytechnic Institute of New York; Ph.D. 1970, University of Michigan

Alfred Abraham Wolf, *Professorial Lecturer in Engineering*
B.S.(E.E.) 1948, Drexel University, M.S.(E.E.) 1954, Ph.D. 1958, University of Pennsylvania, Sc.D. 1977, M.D. 1978, University of Juarez

Chieh Wu, *Associate Professorial Lecturer in Engineering*
B.S. Ch.E. 1960, Chung Yang College of Science & Technology, China, M.S.(Ch.E.) 1968, Villanova University, M.S. 1972, Ph.D. 1975, Drexel University

William W. Wu, *Associate Professorial Lecturer in Engineering*
B.S.E.E. 1961, Purdue University; M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1976, Johns Hopkins University

Michael Yachnis, *Professorial Lecturer in Engineering*
B.S. 1943, Military Academy, Greece; M.S. 1956, M.E.A. 1962, D.Sc. 1968, George Washington University

Jann-Nan Yang, *Professor of Engineering and Applied Science*
B.S. 1961, National Taiwan University; M.S. 1964, University of Hawaii; D.Sc. 1967, Columbia University

Edward Carson Yates, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1948, M.S. 1949, North Carolina State University at Raleigh; M.S. 1953, University of Virginia; Ph.D. 1959, Virginia Polytechnic Institute and State University

A. M. Yen, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1960, Taipei Institute of Technology; Ph.D. 1969, Johns Hopkins University

Vujica Yevjevich, *Research Professor of Engineering*
C.E. 1936, University of Belgrade, Yugoslavia; H.E. 1938, University of Grenoble, Switzerland; D.Eng. 1955, Serbian Academy of Sciences, Yugoslavia

James Chun-ying Yu, *Associate Professorial Lecturer in Engineering*
B.S. 1962, National Taiwan University; M.S. 1968, Ph.D. 1971, Syracuse University

Shao Wen Yuan, *Professor of Engineering and Applied Science*
B.S. 1936, University of Michigan; M.S. 1937, Ph.D. 1941, California Institute of Technology; Ae.E. 1939, Stanford University

Mona Elwakkad Zaghloul, *Assistant Professor of Engineering and Applied Science*
B.S.(E.E.) 1965, Cairo University, Egypt; M.S.(E.E.) 1970, M.Math. 1971, Ph.D. 1975, University of Waterloo, Canada

Ernest Edward Zarnick, *Assistant Professorial Lecturer in Engineering*
B.S. 1951, New York State Maritime College; M.M.E. 1969, Ph.D. 1972, Catholic University of America

Tse-Fou Zien, *Professorial Lecturer in Engineering*
B.S. 1958, National Taiwan University; M.S. 1963, Brown University; Ph.D. 1967, California Institute of Technology

Arthur Jay Ziffer, *Associate Professorial Lecturer in Engineering*
B.S. 1952, City University of New York, Queens College; M.S. 1954, University of Chicago

Index

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Facts About The George Washington University

General Information	Private, nonsectarian, coeducational, founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-Campus Students	8,926 full-time, 9,847 part-time
Geographical Origin of Students	50 states, District of Columbia, 120 countries
Number of Full-Time Faculty	1,095 (89% with doctoral degrees)
Number of Part-Time Faculty	570 (includes some of the most distinguished men and women in Washington)
Room and Board	Cost varies from approximately $3,500 to $3,990 for the academic year (see pages 236–37)

Undergraduate majors: Accounting, American Civilization, American Literature, Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classical Humanities, Computer and Information Systems, Computer Science, Criminal Justice, Dramatic Art, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, English Literature, Environmental Studies, Fine Arts, French Language and Literature, Geodesy, Geography, Geology, Germanic Languages and Literatures, History, Human Kinetics and Leisure Studies, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Mathematics, Mechanical Engineering, Medical Technology, Middle Eastern Studies, Middle School Education, Music, Nurse Practitioner, Nursing Anesthesia, Operations Research and Computational Science, Philosophy, Physician Assistant, Physics, Political Communications, Political Science, Psychology, Public Affairs, Radio-Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Secondary Education, Sociology, Spanish-American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech-Language Pathology and Audiology, Statistics, Urban Affairs, Zoology

Study leading to graduate or professional degrees is offered in the Graduate School of Arts and Sciences, the National Law Center, the School of Medicine and Health Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

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The Graduate School of Arts and Sciences, 1893

The School of Medicine and Health Sciences, 1825

The National Law Center, 1865

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Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

National Law Center: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

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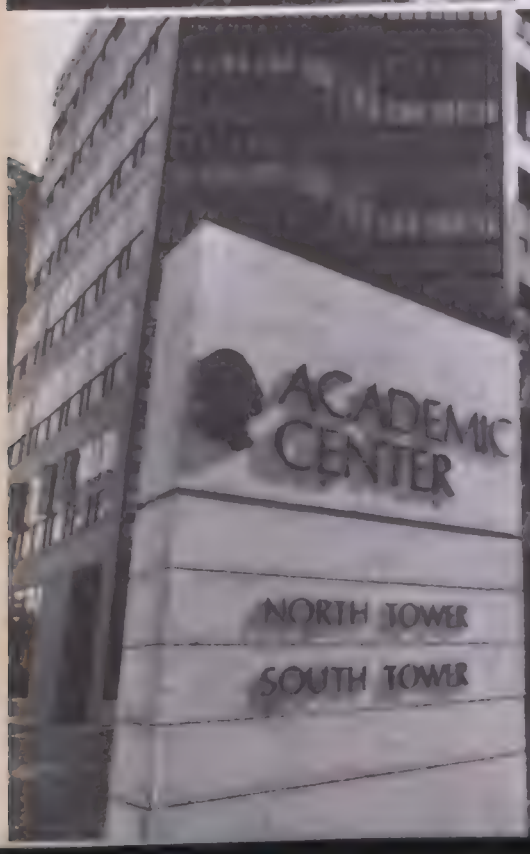
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School of Government and Business Administration: Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Urban and Regional Planning (M.U.&R.P.), Post-Master's Graduate Certificate in Health Services Administration (Grad.Cert. in H.S.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

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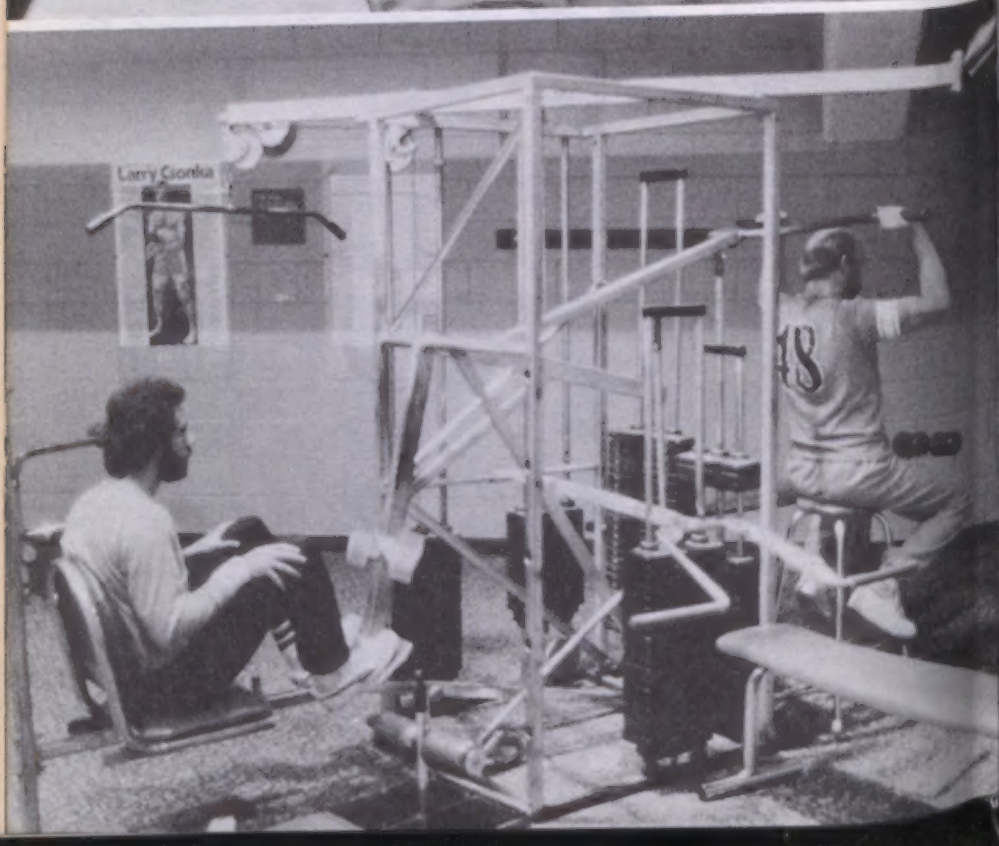



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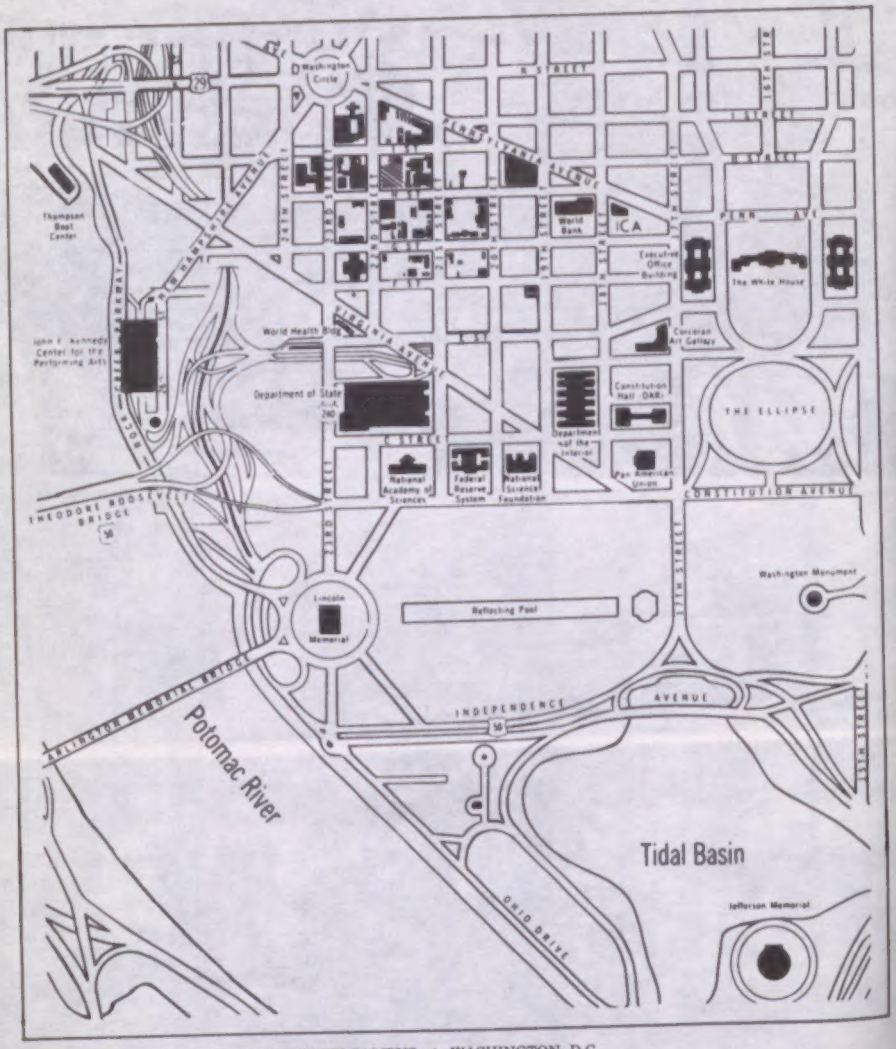

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